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ADAPTIVE RESEARCH REPORTS

RAPPORTS DE RECHERCHES SUR L'ADAPTATION

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Plant Industry Branch
Direction de l'industrie végétale

New Brunswick Department of Agriculture
Ministère de l'Agriculture du Nouveau-Brunswick

VOL. 11

1989 ADAPTIVE RESEARCH REPORTS

RAPPORTS DE RECHERCHES SUR L'ADAPTATION 1989

PLANT INDUSTRY BRANCH
DIRECTION DE L'INDUSTRIE VÉGÉTALE
New Brunswick Department of Agriculture
Ministère de l'Agriculture du Nouveau-Brunswick

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INTRODUCTION

This is the eleventh edition of the Adaptive Research Report. Each year the Plant Industry Branch publishes the results of various projects conducted by staff members.

The Reports, for farmers and agrologists, covers technology transfer activities conducted by the four sections of the Plant Industry Branch, namely Horticulture, Plant Health, Field Crops and Land Resources.

I wish to acknowledge the efforts of the staff and extend thanks to all producers and organizations that cooperated in the projects. A special recognition is made to Branch secretaries for typing the reports.

The financial funding of the cost-shared Canada-New Brunswick Agri-Food Development Subsidiary Agreement and the Canada-New Brunswick Livestock Feed Development Agreement are acknowledged in supporting a number of projects.

The Report is brought together and published through very capable efforts of the editor, David Finnamore, assisted by Serge Michaud.

E.T. Pratt
Executive Director
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Voici la onzième édition des rapports de recherches sur l'adaptation. Chaque année, la Direction de l'industrie végétale publie les résultats de divers projets réalisés par son personnel.

Ces rapports renseignent les agriculteurs et les agronomes sur les activités de transfert de technologie dirigées par les quatre sections de la Direction de l'industrie végétale, soit l'Horticulture, la Santé des végétaux, les Grandes cultures et les Ressources des terres agricoles.

Nous remercions tous les producteurs et les organismes qui ont collaboré aux projets, sans oublier l'excellent travail de tous les membres du personnel. Une mention spéciale aux secrétaires de la Direction qui ont dactylographié les rapports.

Nous soulignons également la contribution financière de l'entente auxiliaire Canada/Nouveau-Brunswick sur le développement du secteur agro-alimentaire et celle de l'entente Canada/Nouveau-Brunswick sur le développement du secteur des provendes pour beaucoup de ces projets.

Nous devons également noter la compétence avec laquelle M. David Finnamore, chargé de publication, s'est occupé de l'organisation et de la publication des rapports, avec l'aide de M. Serge Michaud.

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SERIES I FRUIT TESTING NETWORK EVALUATION

S. Stuible and R. Tremblay

ABSTRACT: Preliminary results from the Series I planting confirm the relative growth characteristics of the four rootstocks (Beautiful Arcade > Alnarp 2 > Milwaukee > Malling Merton 111) and three cultivars (Lobo > Dewar McIntosh > Summerland McIntosh on Ottawa 3 interstem) tested. Performance at different sites, however, was inconsistent. Tree mortality figures suggest Beautiful Arcade, generally the fastest growing rootstock, was least likely to survive.

ÉVALUATION DE LA PREMIÈRE SÉRIE DU RÉSEAU D'ESSAI D'ARBRES FRUITIERS

Résumé: Les résultats préliminaires obtenus sur les plantations de la première série confirment les critères de croissance relatifs des quatre porte-greffe (Beautiful Arcade > Alnarp 2 > Milwaukee > Malling Merton 111) et des trois cultivars (Lobo > Dewar McIntosh > Summerland McIntosh sur le sujet intermédiaire Ottawa 3) qui ont été mis à l'essai. On n'a pas obtenu de rendement constant aux divers sites de plantation. Trois cas de mortalité indiquent que la variété Beautiful Arcade, qui est le porte-greffe qui pousse généralement le plus vite, a eu plus de difficulté à survivre que les autres variétés.

INTRODUCTION: Since the heavy winter losses of the early 1980s, there has been demand for research into rootstocks to withstand New Brunswick winters. The Fruit Tree Testing Network was established by the New Brunswick Fruit Growers Association to test various rootstocks (and scion combinations) on-farm. Initial data on tree survival and growth have been collected on the Series I plantings, and yield measurements will be taken as the trees come into bearing. Preliminary results will be reported below.

MATERIALS AND METHODS: Series I trees were planted in 1987 (on five sites) and 1988 (on four of the five sites). The rootstock/scion combinations are shown in Table 1, below.

TABLE 1: ROOTSTOCK/SCION COMBINATIONS IN THE SERIES I PLANTATION.

	Rootstock			
Cultivar	MM111	A2	BA	MLWKE
DMAC	1987	1987	1987	---
SUMM	---	---	1987	---
LOBO	1987	1987	1987	---
SUMM/O3	1987	1987	1988	1988
LOBO/O3	1988	1988	1988	1988

The five sites are as follows: Ferme Belliveau in Pres d'en Haut (1); D. Coburn in Keswick Ridge (2); La Fleur du Pommier in Cocagne (3); J. Lamoreau in Centerville (4); and Uris Williams and Sons in St. Antoine (5). A randomized block design was attempted, although not always successfully given tree availability and site

size. Each site did not plant trees of every rootstock/scion combination, and the number of trees per site was also not constant. For more detail on the tree numbers and combinations per site, refer to Tables 2(c) and 3(c), appended.

Detailed data on trunk circumference and terminal growth are reported in Tables 2 and 3 at the end of this paper. The data means are presented in bar graphs for the sake of clarity, and are the basis of the following discussion. Problems of missing data have precluded statistical analyses to date, thus caution must be taken in the interpretation of the results below.

RESULTS AND DISCUSSION:

Trunk Circumference: Figures 1 (a) and (b) show the trunk circumferences for the 1987 and 1988 plantings, respectively. These are expressed as averages over each of the cultivars, rootstocks and sites in terms of initial circumference and subsequent annual growth.

A. By Cultivar: In the 1987 planting, LOBO tree trunks grew slightly more in both 1988 (36 mm) and 1989 (27 mm) than DMAC (at 34 and 25 mm), and considerably more than SUMM/O3 (30 and 19 mm), as might be expected given the dwarfing influence of Ottawa 3. The 1988 planting has grown considerably slower in 1989, at 14 and 22 mm for LOBO/O3 and SUMM/O3, respectively.

B. By Rootstock: In the 1987 planting, all the rootstocks averaged 33 mm of growth in 1988, but in 1989 BA outgrew both A2 and MM111 at 29, 25, and 21 mm, respectively. In the 1988 planting the 1989 trunk growth was 20, 17, 15 and 10 mm for BA, A2, MLWKE, and MM111, respectively. Thus the ranked growth for the different rootstocks was the same for the two plantings in 1989, that is BA>A2>MM111 with MLWKE intermediate between A2 and MM111.

C. By Site: Recall that sites 3 and 5 are in Kent county, site 1 is in Westmorland, site 2 is in Queens and site 4 is in Charlotte county. In the 1987 planting, trunk growth in 1988 was 41, 36, 34, 30, and 27 mm at sites 3, 2, 1, 5, and 4, respectively. The only surprise in this is the difference between growth in sites 3 and 5, which are located within view of each other. These rankings were not consistent - in 1989 trunk growth was 34, 33, 28, 18 and 10 mm for sites 5, 4, 1, 3, and 2. Note how sites 3 and 5 switched places in the ranking, as did the cooler site 4 (Charlotte county) and site 2. These switches in rank cannot be explained at this time. The 1988 planting exhibited virtually no difference between sites, with all sites averaging either 16 or 17 mm of trunk growth.

FIGURE 1 (a) TRUNK GIRTH OF 1987 PLANTINGS
AVERAGED BY CULTIVAR, STOCK AND SITE

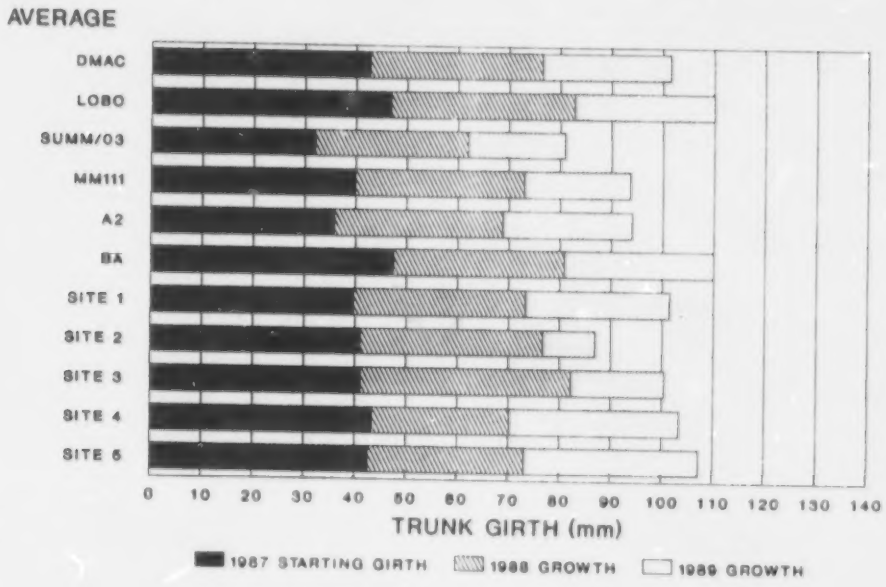
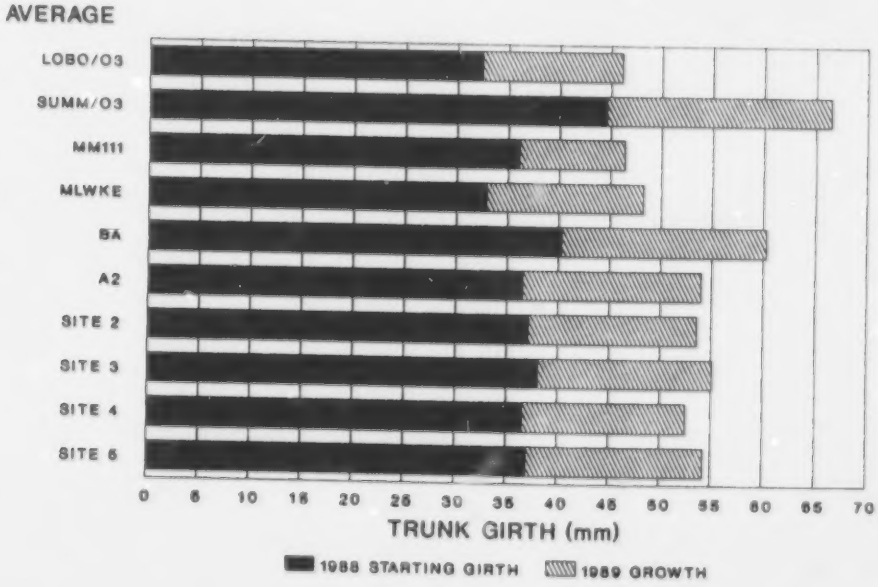


FIGURE 1 (b) TRUNK GIRTH OF 1988 PLANTINGS
AVERAGED BY CULTIVAR, STOCK AND SITE



Terminal Growth: Figures 2 (a) and (b) show the terminal growth of the 1987 and 1988 plantings, respectively. These are expressed as averages over each of the cultivars, rootstocks and sites for each year.

A) By Cultivar: In the 1987 planting, terminal growth was highest in 1988 for all cultivars. The 1987 (first year) growth was weak (27 to 35 cm) and there was little difference between cultivars. In both 1988 and 1989, LOBO grew the most (85 and 64 cm), while DMAC ranked second (79 and 59 cm) and SUMM/O3 ranked third (65 and 41) as expected. In the 1988 planting, SUMM/O3 outgrew LOBO/O3 in the first year (38 to 30 cm) but the situation was reversed in 1989 (42 to 47 cm, respectively).

B) By Rootstock: In the 1987 planting, there was little difference among rootstocks in either 1987 or 1988 (at 28 to 34 and 74 to 76 cm, respectively). However, in 1989 the ranking was BA>A2>MM111 at 67, 59, and 49 cm, respectively. In the 1988 planting the ranking was BA>A2>MM111>MLWKE in the first year (at 39, 37, 28 and 26 cm) and A2>BA>MM111>MLWKE in 1989 (at 65, 52, 41, and 32 cm). The absolute differences are greater in 1989, thus the 1989 ranking is likely more significant.

C) By Site: In the 1987 planting, terminal growth data was not available for site 2 in 1987 or for site 1 in 1988. The terminal growth averaged 42, 40, 28 and 13 cm for sites 5, 3, 1 and 4 in 1987; 90, 87, 73, and 58 cm for sites 5, 3, 2 and 4 in 1988; and 79, 59, 54, 46 and 46 for sites 1, 5, 3, 2 and 4 in 1989. As one would expect, sites 5 and 3 are highest (and similar) and site 4 is lowest in terminal growth. In the 1988 planting there is again virtually no difference between sites, with growth ranging from 33 to 34 cm in 1988 and 47 to 49 cm in 1989.

FIGURE 2 (a) TERMINAL GROWTH OF 1987 PLANTINGS
AVERAGED BY CULTIVAR, STOCK AND SITE

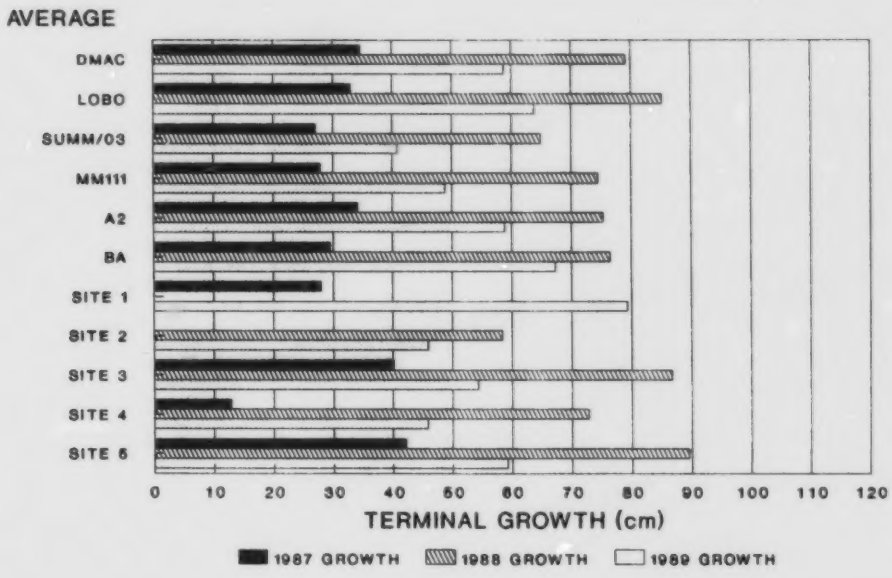
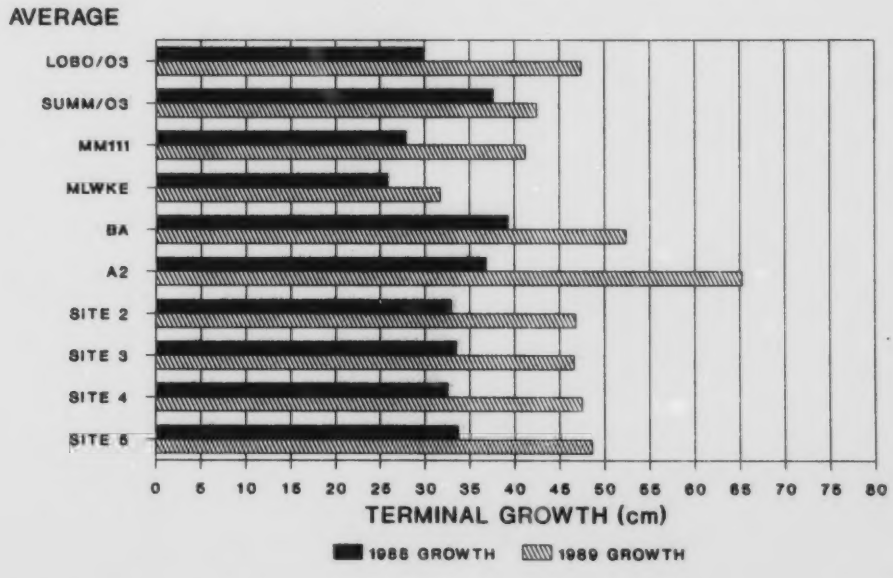


FIGURE 2 (b) TERMINAL GROWTH OF 1988 PLANTINGS
AVERAGED BY CULTIVAR, STOCK AND SITE



Shoot/Trunk Growth: The following discussion pertains to the relationship between trunk growth and terminal growth as illustrated in Figures 3 (a) and (b) in terms of cultivar, rootstock and site averages. The data is expressed as a ratio of terminal growth (mm) per unit increase in trunk circumference (mm).

A) By Cultivar: In the 1987 planting, there is little difference in shoot/trunk growth (a ratio of about 23.5) between LOBO and DMAC in either 1988 or 1989. However, they are both somewhat higher than SUMM/O3 (about 21.5). Thus, shoot growth was favoured over trunk growth to a greater extent in the cultivars without the Ottawa 3 interstem. In the 1988 planting, however, there was considerable difference in the response of LOBO and SUMM to the effects of the Ottawa 3 interstem - the ratios were 34.7 and 19.5, respectively.

B) By Rootstock: In the 1987 planting, there was little effect of rootstock on the shoot/trunk growth ratio in either 1988 or 1989, although there was a slight difference between years. In the 1988 planting there was a considerable difference between rootstocks, where the ratios were 39.9, 37.5, 26.2 and 20.8 for MM111, A2, BA and MLWKE, respectively. This suggests shoot growth was more favoured over trunk growth for MM111 and A2 than for BA and MLWKE.

C) By Site: In the 1987 planting, there was a considerable (albeit inconsistent) site effect on shoot/trunk growth in both 1988 and 1989. In 1988 the ratios were 29.4, 27.1, 21.1 and 16.3 for sites 5, 4, 3, and 2, respectively. In 1989 they were 44.8, 29.7, 28.3, 17.4 and 13.8 for sites 2, 3, 1, 5, and 4, respectively. In the 1988 planting there was little site effect on shoot/trunk growth, with values ranging from 27.5 to 29.9.

FIGURE 3 (a) SHOOT/TRUNK RATIO OF 1987 PLANTINGS
AVERAGED BY CULTIVAR, STOCK AND SITE

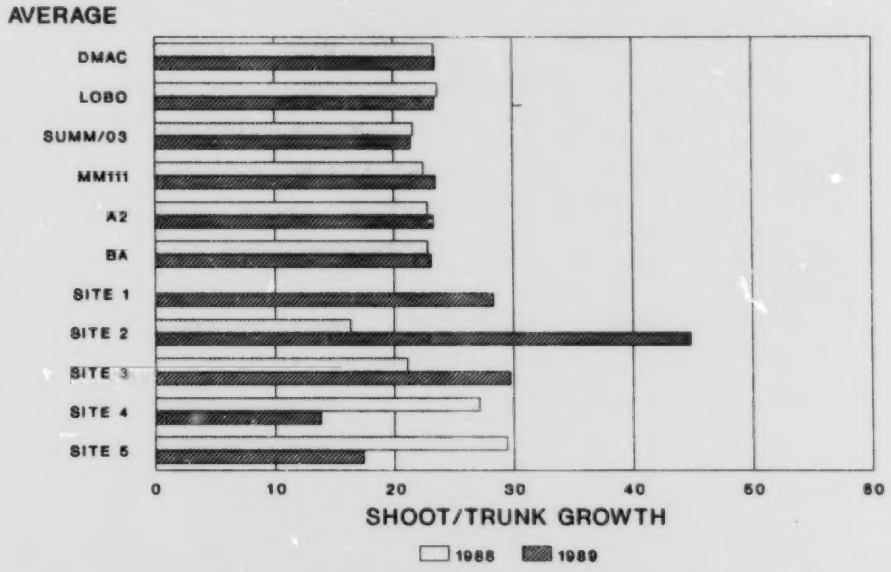
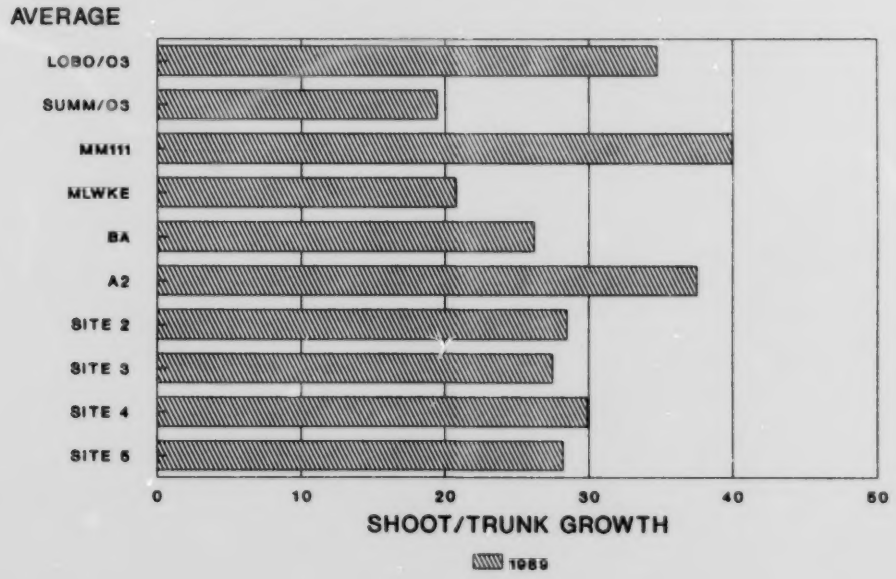


FIGURE 3 (b) SHOOT/TRUNK RATIO OF 1988 PLANTINGS
AVERAGED BY CULTIVAR, STOCK AND SITE



CONCLUSIONS: In summary, cultivar effects were as expected - for both shoot and trunk growth the rankings were generally LOBO>DMAC>SUMM/03, and the effects on the shoot/trunk growth ratio were negligible. Rootstock effects on both trunk and terminal growth generally produced the same rankings, BA>A2>MLWKE>MM111, while the shoot/trunk growth ratio was, with one exception, unaffected. Site effects on terminal growth were fairly understandable, with sites in Kent county in the lead and the colder Charlotte county trailing. Site effects on both trunk growth and shoot/trunk growth were contradictory over the two years studied.

The above analysis is only preliminary, and needs to be repeated statistically to see which conclusions, if any, can be drawn. It is also too early to make definitive conclusions about tree mortality, although it appears BA suffered the most losses (13 trees). Since it was also the most vigourous rootstock, this suggests growth was at the expense of hardiness.

I would like to acknowledge the cooperation of the orchardists who are taking part in this study for their time and effort: Robert Bourgeois, Leopold and Euclid Bourgeois, Donald Coburn, Janet Lamoreau and Eddy Williams. I would also like to extend thanks to the technicians who have assisted on this project, Deborah Arnold and Christine Murray, as well as my colleague Evans Estabrooks, who helped establish this project.

WINDBREAKS FOR APPLE ORCHARDS

George Read[1] and Eddie Williams[2]

ABSTRACT: A demonstration site was established at St. Antonie, N.B. on the farm of Eddie Williams to examine the effects of an artificial windbreak on the growth and fruit bearing characteristics of young apple trees. The windbreaks were erected in 1986 on the leeward side of the orchard. The first year of significant fruiting produced greater yields behind the windbreaks on the five-year-old trees.

EFFET DE BRISE-VENT SUR LES VERGERS DE POMMIERS

Résumé: Un site expérimental a été établi sur la ferme de M. Eddie Williams à St-Antoine (N.-B.) afin de vérifier l'effet d'un brise-vent artificiel sur la croissance et la fructification de jeunes pommiers. Le brise-vent a été érigé en 1986 sur le côté du verger placé sous le vent. La première année de fructification importante, les meilleurs rendements ont été obtenus sur des arbres de cinq ans protégés par le brise-vent.

INTRODUCTION: Windbreaks have been used in various parts of the world for centuries as a means of reducing environmental stress and improving the quality and yields of many crops. Windbreak use in England have resulted in larger yielding orchards. It has been thought that windbreaks will only serve a useful purpose when wind exposure is excessive. Under these conditions, windbreaks provide their most beneficial effects. A study produced in Western New York state, Norton (1976), revealed that after fourteen years, the amount of loss to damage from the wind through reduced volume development and reduced production capacity of the orchard accounted for thirty-five percent of the total production. If wind speed is reduced on such sites the potential for the tree is markedly increased, Jones (1983). In wind-protected sites, early fruit tree growth was improved especially on dwarf and semi dwarf rootstocks Norton (1984). The reason for this reduced growth is not well understood, however it has been suggested that the constant shaking of the tree by wind produces ethylene which results in stunted and abnormal growth, Leopold et al., (1972); Robitaille and Leopold, (1974).

Sturrock (1984), summarized that windbreaks were important for improving pollination and fruit set, preventing damage to buds, leaves, twigs and fruit, and reducing premature fruit drop and improving yields.

MATERIALS: The windbreak trial consisted of two 100m plastic netted fences 2m high supported by 4x4 wooden posts, along with two control areas. There were approximately 115 trees under the influence of the two fences. The trees were McIntosh variety grafted on Ottawa 3 interstem, rootstock M111. The trees were planted in

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[1]. Agricultural Climatologist
[2]. Apple Producer, St. Antoine, NB

1984 and the artificial windbreak was erected in 1986. All management factors were carried out by the producer. The windbreak fence was removed each winter and was replaced at a greater height the next year. The erection posts were long enough to permit this (approximately 12 remaining above ground).

RESULTS AND DISCUSSION: A paired t-test was performed on the data from shelter and the open. The sheltered treatments out yielded the control by 60 percent. (See table 1.) Part of the yield difference maybe attributable to the trees reaching earlier maturity under the influence of shelter. The quality of the fruit on the young trees was excellent. No assessment was made on this factor by treatment.
The trial will be continued for a number of years to determine the yield impact, longevity of the artificial windbreak, and the economic potential of this management practice.

TABLE 1.

Treatment	Mean (ave. lb./tree)	Standard Dev.
Open	1.4	.25
Windbreak	2.24*	.58

* Significant at the .05 % level. (paired t-test)

ACKNOWLEDGEMENTS: The original project was funded through the AFA II subsidary agreement.

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EFFECT OF SUBSOILING ON APPLE TREE GROWTH

K.T.V. Michalica

ABSTRACT: Tree growth on soil improved by subsoiling was significantly increased in comparison to control. The average tree trunk diameter, measured six years after subsoil improvement, was increased by 0.6 to 0.8 cm, which represents an increase of 9 to 13%.

EFFET DU SOUS-SOLAGE SUR LA CROISSANCE DES POMMIERS

Résumé: On a constaté que la croissance des pommiers est beaucoup améliorée par le sous-solage du terrain. Le diamètre moyen du tronc des pommiers mesuré six ans après le sous-solage, avait augmenté de 0,6 à 0,8 cm par rapport à celui des pommiers témoins, ce qui représente une augmentation de 9 à 13 %.

MATERIALS AND METHODS: Subsoiling was performed at two orchard sites, namely Cocagne and Haute Aboujagane. The soils at both sites were similar in their physical properties. The topsoil was loamy, underlied by clay-loam, compacted subsoil (lodgement till). The depth to compacted layer ranged from 35 to 45 cm. The drainage of both sites was impeded due to the shallow depth of slowly permeable subsoil. The slope of the sites ranged from 0 to 9%. Both sites were drained by systematically placed tiles at approximately 100 cm depth.

Subsoiling to a depth of 90 cm with rips 150 cm apart was performed in the summer of 1983 under higher than optimum soil moisture conditions. Several 100 cm deep soil pits were excavated in both orchards in the summer of 1989 in order to observe retention of rips, root penetration and soil moisture distribution.

Tree trunk diameter was measured at a height of 50 cm above the soil surface.

RESULTS AND DISCUSSION: The tree trunk diameters (measured at 50 cm above the soil surface) collected in sequence from the crest to the bottom of the slope are presented in Tables 1 and 2.

On average, tree trunks grown on subsoil sites grew 0.6 to 0.8 cm larger in diameter in comparison to the control. This increase represents a 9-13% increase over the control.

The rips performed at a distance of 150 cm from tree rows were functioning 6 years after the subsoiling. While the majority of root growth ceased at 40 to 45 cm below soil surface, within the rips, the roots expanded to 80 cm. The seepage water was also moving freely within the entire depth of rips and had a shorter distance to travel into tiles.

**TABLE 1: APPLE TREE TRUNK DIAMETER (cm)
AS AFFECTED BY SUBSOILING
(SITE: HAUTE ABOUJAGANE, ORCHARD 9 YEARS OLD,
SIX YEARS FOLLOWING SUBSOILING)**

TREE TRUNK DIAMETER (cm)		DIFFERENCE (cm)
Subsoiled	Control	Subsoiled-control
9.5	10.3	- 0.8
11.5	7.6	+ 3.9
7.7	9.8	- 2.1
10.6	8.5	+ 2.1
10.0	6.4	+ 3.6
10.5	7.6	+ 2.9
9.4	10.9	- 1.5
8.8	8.9	- 0.1
9.4	9.9	- 0.5
10.0	9.9	+ 0.1
10.2	9.6	+ 0.6
10.9	9.6	+ 1.3
9.9	8.4	+ 1.5
10.5	6.3	+ 4.2
9.8	9.8	0.0
12.1	10.5	+ 1.6
10.3	10.9	- 0.6
7.6*	9.1	- 1.5
10.4	9.4	+ 1.0
9.8	9.8	0.0
10.6	9.5	+ 1.1
4.5	2.1	+ 2.4
5.0	4.2	+ 0.8
Average 9.5	8.7	+ 0.8

* Tree severely infested with canker.

**TABLE 2: APPLE TREE TRUNK DIAMETER (cm)
AS AFFECTED BY SUBSOILING
(SITE: COCAGNE, ORCHARD 7 YEARS OLD,
SIX YEARS FOLLOWING SUBSOILING)**

TREE TRUNK DIAMETER (cm)		DIFFERENCE (cm)
Subsoiled	Control	Subsoiled-control
8.8	7.3	+ 1.5
8.0	5.2	+ 2.8
9.7	7.0	+ 2.7
7.2	6.5	+ 0.7
8.3	7.4	+ 0.9
9.2	7.5	+ 1.7
8.9	7.9	+ 1.0
8.6	6.5	+ 2.1
8.4	7.5	+ 0.9
7.7	6.6	+ 1.1
5.8	5.7	+ 0.1
6.5	6.7	- 0.2
3.4	3.8	- 0.4
2.8	3.3	- 0.5
4.1	4.1	0.0
2.6	2.7	- 0.1
3.5	3.4	+ 0.1
3.9	2.7	+ 1.2
3.8	3.6	+ 0.2
1.9	2.5	- 0.6
3.3	3.3	0.0
2.9	2.6	+ 0.3
3.2	3.5	- 0.3
2.8	2.7	+ 0.1
3.1	3.1	0.0
2.5	0.8*	+ 1.7
2.9	3.8	- 0.9
2.6	1.7	+ 0.9
3.6	3.6	0.0
Average 5.2	4.6	+ 0.6

* Tree severely infested with canker.

Subsoiling was performed on experimental sites only after plantation of both orchards. It seems highly probably that the effects of subsoiling would have been yet more pronounced if the rips were performed directly under the tree rows prior to orchard establishment.

ACKNOWLEDGEMENTS: The cooperation of growers Leopold and Euclide Bourgeois, Jean-Albert Cormier and Roger Nima was greatly appreciated.

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IMPACT OF BORON TREATMENTS ON RASPBERRY PRODUCTION

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and K. Mellerowicz[1]

ABSTRACT: A fertility trial was established in 1987 in Minto at Mr. Henry Goguen. Two different rates of boron were applied on a block of raspberries in a completely randomized block design. There was no positive treatment effect on yield.

EFFET DU BORE SUR LES FRAMBOISIERS

Résumé: On a commencé en 1987 à faire l'essai du bore sur les framboisiers de M. Henry Goguen à Minto (N.-B.). Deux différents taux de bore ont été appliqués sur un bloc de framboisiers dans un dispositif expérimental entièrement divisé au hasard. On ne signale aucun effet positif des traitements sur le rendement.

INTRODUCTION: A good fertility program is very important in order to grow a raspberry plantation that will last for fifteen years or more. Some of the nutrient deficiencies can be detected by leaf analysis and in some major cases of inadequacy by observing the leaves of the plants. In New Brunswick, boron deficiency is recognized by both detection methods in a lot of cases. Addition of boron can be done by foliar or soil applications.

Acceptable levels of micronutrients are important since deficiency or toxicity can cause low yields or multiple negative effects. The micronutrient boron plays important roles in higher plants: in protein synthesis, nitrogen and carbohydrate metabolism, root system development, fruit formation and water relations. For example, a boron deficiency decreases the rate of water absorption and of translocation of sugars in plants (Brady, 1974).

MATERIALS AND METHODS: This raspberry trial was established in 1987 at Mr. Henry Goguen in Minto N.B.. Three treatments of boron were replicated three times in a completely randomized block design. The first treatment consisted of two pounds of boron (active boron) per acre, one pound of boron (active boron) per acre for the second one, and no boron for the third treatment. The source of boron was from a product called Solubor (20% boron) and Festival was the selected cultivar.

Mr. Goguen applied 1,000 pounds per acre of 10-10-10 in the spring of 1987. The soil test values (kg/ha) and rating in 1987 were: pH 6.0 ; phosphate 323 VH[2] ; potash 236 H ; calcium 3549 VH ; magnesium 155 M.

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[1]statistician

[2]VH=very high; H=high; M=medium

The boron was applied by foliar application with a CO_2 backpack on June 18, 1987 and June 7 (full bloom), 1988. In both cases, no foliar water was applied to the control with the backpack on those dates. In 1988(May 27) Mr. Goguen applied 200 pounds per acre of 15-15-15 .2B and 66 pounds per acre of 15-15-15 .2B (on plant rows only) in the spring of 1989. This application of boron made by the grower wasn't part of the trial. No foliar application of boron was made in 1989 since there was maybe a carry over effect of boron caused by both modes of application.
All other cultural practices were the same on the whole plantation.
Leaf samples were taken for foliar analysis on July 21, 1987, and on June 7 and 23, 1988.

RESULTS AND DISCUSSION: In 1987 the boron levels in the leaf analysis of the control were of 16, 14, and 22, for an average of 17 parts per million (ppm). This level is considered to be inadequate for raspberry production in New Brunswick. The different levels of fertility for boron content in raspberry leaves have been set at : Low < 20 ppm; Sufficient 25-35 ppm; and High > 60 ppm (Stang). In the 1988 leaf analysis, two of the three blocks that received the 2 lbs B/acre, had levels of more than 120 ppm. This is a situation in which toxicity is probable to occur. Leaf analysis means for all the elements was compared with E.J. Stang standards and the following results were found: N, K, Ca, Zn, B(for 1988 only), and Mn were all high to excessive while P, Mg, B(for 1987), Cu, and Fe were all in the sufficient range. A different sampling time would give us different results for some elements.

For the purpose of statistical analysis we assumed that there was no gradient in microsite conditions between rows as well as along the same row. Similarly, approximately three week difference in schedule of boron applications in 1987 and 1988 was assumed to have no effect. All this and the facts that (i) treatments were not continued through 1989, and (ii) no tissue analysis was performed in 1989, as well as that (iii) fruit elemental contents and levels of sucrose were determined only for 1988, were responsible for adopting the following methods of statistical analyses:

1. Analyses of variance of fixed models and crossed effects to test

a) year and treatment effects on yield and leaf elements for 1987 and 1988,

b) year and treatment effects on yield for 1987-1989,

c) treatment effects on sucrose and fruit elements for 1988

2. Factor analyses to summarize the variation of

a) yield and leaf elements in 1987 and 1988,

b) yield, sucrose, and fruit and leaf elements in 1988 only.

Results for analyses of variance are presented in Table 1a, b, and c. There was a significant increase in leaf boron due to boron application (Table 1a). Yield in 1988 was significantly greater than in 1987, and in 1987 in turn, it was greater than in 1989 (Table 1b). In general, it takes at least three years after plantation establishment to get a satisfactory yield. In 1988, the plantation was only four years old. This could be one of the reason for a higher yield than in 1987. This analysis showed no positive boron treatment effect on yield. This was the information we were looking for but we were hopeful that the opposite would have happenned and that we would have gotten an increase in yield with an increase of boron. Leaf and fruit calcium levels practically didn't change at all between years and treatments. The dry matter content of the fruits was of 13.4%.

In both performed factor analyses, three factors appeared to best summarize the variation for variables: in the first one across 1987 and 1988 years, a "year" factor (Factor 1), a "treatment" factor (Factor 2), and "leaf calcium related" factor (Factor 3) (Table 2). A total variation of 66.2% is explained by these three factors. Importance of the "year" (Factor 1) and "treatment" (Factor 2) parallels the results from the Analysis of Variance. However, the "leaf calcium" (Factor 3) contrasts number of leaf elements (K, P, Cu) with calcium.

Three factors retained in the second factor analysis (Table 3) were: a "sucrose" factor (Factor 1), a "treatment" factor (Factor 2), and a "calcium related" factor (Factor 3). A total variation of 69.8% is explained by these three factors. Fruit sucrose (Factor 1) seems to be positively related to leaf iron and magnesium and negatively related to these elements and phosphorus in fruits. Factor 2 indicates that for the analysed data the yield decreases with (i) higher level of boron applied, or (ii) higher leaf and fruit boron content or still with (iii) higher level of fruit zinc and copper. Factor 3 as in the previous analysis, links negatively leaf and fruit calcium with the same leaf elements and additionaly with fruit manganese.

Table 1. Means and standard deviations for raspberry yield, sucrose, leaf and fruit elemental content, by year (where applicable) and boron treatment. Letters a, b, c, denote significant differences according to Duncan multiple range test at the 0.05 level.

a)

Variable	Year		Treatment (lb/ac)		
	1987	1988	0	1	2
Yield (kg/plot)	7.89b	9.57a	8.91	8.89	8.40
	0.73	0.83	1.55	1.09	0.86
Leaf					
N (%)	3.75b	4.21a	3.94	4.07	4.00
	0.16	0.24	0.34	0.38	0.24
P (%)	0.30	0.33	0.32	0.32	0.32
	0.01	0.04	0.05	0.03	0.02
K (%)	1.81	1.74	1.77	1.77	1.80
	0.12	0.17	0.15	0.20	0.09
Ca(%)	1.26	1.29	1.28	1.28	1.27
	0.09	0.17	0.17	0.12	0.08
Mg(%)	0.46a	0.41b	0.41	0.45	0.44
	0.04	0.04	0.05	0.05	0.04
Zn(ppm)	55a	39b	46	48	47
	7	8	5	15	13
B (ppm)	28b	66a	24c	45b	72a
	9	36	8	16	42
Cu(ppm)	8.7	9.7	9.5	8.8	9.2
	0.7	1.1	1.0	1.2	1.0
Mn(ppm)	147	115	141	134	118
	31	23	40	32	17
Fe(ppm)	83	88	81	88	87
	22	21	22	22	23

Table. 1 continued...

b)

Variable	Year			Treatment (lb/ac)		
	1987	1988	1989	0	1	2
Yield (kg/plot)	7.89b	9.57a	6.34c	8.21	7.90	7.70
	0.73	0.83	0.87	1.65	1.80	1.40

c)

Variable	Treatment (lb/ac)		
	0	1	2
Fruit			
Sucrose (%)	8.39	8.41	8.21
	0.56	0.59	0.96
P (%)	0.23	0.24	0.24
	0.03	0.02	0.03
Ca(%)	0.23	0.22	0.23
	0.03	0.01	0.04
Mg(%)	0.13	0.14	0.14
	0.01	0.01	0.01
Zn(ppm)	27b	25b	37a
	7	3	8
B (ppm)	18b	20b	22a
	2	2	1
Cu(ppm)	7.5ab	7.2b	8.8a
	0.8	0.8	1.6
Mn(ppm)	61	60	71
	10	32	29
Fe(ppm)	43b	49a	44ab
	2	3	6

Table 2. Factor analysis for raspberry yield and leaf elemental content data: factor loadings, sorted by factor, for three most important factors.

Variable	Factor 1	Factor 2	Factor3
1988	98*[1]	12	-1
Yield	81*	-14	2
N	81*	3	18
1987	-98*	-12	1
Zn	-81*	-7	25
Mg	-56*	25	0
Mn	-54*	-44	-8
2 lb B/ac treatment	-9	82*	3
B	49*	75*	-2
0 lb B/ac treatment	11	-85*	7
K	-24	1	78*
P	49*	6	62*
Cu	54*	-7	58*
Ca	14	-7	-91*

[1]Factor loadings greater than 48 were considered salient.

Table 3. Factor analysis for 1988 raspberry yield, fruit and leaf elemental content data: factor loadings, sorted by factor, for three most important factors.

Variable	Factor 1	Factor 2	Factor3
Sucrose, fruit	95*[1]	-16	-12
Fe, leaf	90*	-2	12
Mg, leaf	58*	15	-2
Mg, fruit	-89*	25	21
P, fruit	-89*	6	-7
Fe, fruit	-68*	5	36
2 lb B/ac treatment	2	93*	-1
B, leaf	26	94*	-1
Zn, fruit	-4	85*	22
B, fruit	-31	82*	-6
Cu, fruit	-50*	56*	43
0 lb B/ac treatment	6	-72*	1
Yield	23	-88*	-5

Table 3. Continued.

Variable	Factor 1	Factor 2	Factor3
Mn, fruit	-26	23	87*
K, leaf	-40	17	74*
Cu, leaf	-3	-7	73*
P, leaf	26	22	72*
Zn, leaf	-21	5	62*
Ca, leaf	14	-16	-90*
Ca, fruit	-49*	2	-76*

1Factor loadings greater than 48 were considered salient.

CONCLUSIONS: Summarizing the results of all statistical analyses we think that (i) the leaf and fruit boron increases with boron application, (ii) the boron increase beyond 120 ppm levels (Stang's high=60 ppm) in foliage and fruits could indicate a possibility of boron toxicity expressed by yield decline in 1989 as a "carry over" effect, (iii) the boron treatment positively affected the levels of some fruit elements (Zn, Cu, and Fe), and (iv) the leaf and fruit calcium displayed different direction of changes than most of other elements.

This experiment leads us to believe that foliar applications of boron are only for temporary corrections. If there is a suspicion of boron or of any other element deficiency, it is advisable to find out from the local agrologist how and when to perform leaf sampling for chemical analysis. However, following a preventive program is better than waiting for visual signs of deficiency. And still, applying boron on plants without knowing if it is needed, may lead to its excess levels resulting in a toxicity and a reduced yield. Preventive program by providing the information on soil and all plant elements helps, in turn, in planning fertilization and it seems to be a necessary tool for successful raspberry plantation.

ACKNOWLEDGEMENT: Appreciation is extended to Mr. Henry Goguen for letting us use his raspberry plantation for this trial and his great cooperation in harvesting the berries in 1987 and 1988 as well as Mr. Randy Buchanan for setting up the trial and doing the spraying of treatments in 1987 and 1988.

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BLUEBERRY PRODUCTION POTENTIAL IN THE ACADIAN PENINSULA.

K. Mellerowicz, S. Michaud, J. MacMillan

ABSTRACT: A study to determine blueberry production potential in the Acadian Peninsula was carried out. Soil and forest cover information was pooled together from existing soil surveys and Arc/Info data base. Almost 3 776 ha and 5 301 ha were identified as suitable on Crown Land and privately owned land respectively. Only a one third of the total area was classified as suitable based on a detailed soil survey. This study showed that process of gathering the information was a long one. To make efficiently management decisions that are based on spatial information e.g. soil surveys, integration of this existing spatial data with the Caris (geographic information system) would be required.

POTENTIEL POUR LA PRODUCTION DU BLEUET DANS LA PÉNINSULE ACADIENNE

RÉSUMÉ: Une étude ayant pour but de déterminer le potentiel pour la production du bleuet nain dans la péninsule acadienne a été effectuée. De l'information sur les sols et le couvert forestier a été amalgamée à partir des cartes de prospection pédologique et de la base de données Arc/Info. Environ 3776 ha de terres de la Couronne et 5301 ha de terres privées ont été identifiés comme ayant du potentiel pour cette culture. Seulement un tiers de la superficie totale a été classifiée comme ayant du potentiel selon les cartes de prospection pédologique détaillées. Cette étude démontre que le processus utilisé est long. Afin de prendre des décisions fondées sur de l'information spaciale e.g. l'intégration de cette information avec le systéme CARIS (système d'information géographique) serait recommandé.

INTRODUCTION: In the last 10 years blueberry acreage has expanded to 13 000 in New Brunswick. There seems to be potential for another 3 000 to 5 000 acres. The Acadian Peninsula share in this growth is substantial, it increased from 1 500 to 5 000 acres and there seems to be a prospect for even more.

Potential for the development of blueberries in any region is determined not only by favorable soil and climate conditions, as well as the land availability but also by existing enterpreneurship. The Acadian Peninsula region seems to have it all. Moreover, this region being primarily fish industry oriented lacks the diversified economy which is usually the least affected in time of crisis in one of the sectors e.g. fisheries. The new low fish quotas seem to create such a situation where alternative occupations are badly needed. All this makes the Acadian Peninsula the perfect search objective for establishment of blueberry potential which was the general objective of this project.

More specifically, the goal of this project was to determine location of sites available for blueberry production in the Acadian Peninsula as well as their surface area according to land use (e.g. forest or burn) and to land ownership (e.g. Crown Land or private).

The results of this project were to provide detailed information as to which of the sites on Crown Land were of management interest to the Department of Agriculture and were to be requested from the Department of Natural Resources and Energy so that this department, in turn,

could lease the land to enterpreneurs.

METHODS: The region considered was defined as limited by the Chaleur Bay on the north and the Gulf of St. Lawrence on the East and South, whereas, land border went along the highway No. 135 from Pokeshaw to St. Isidore and then in straight line to the north side of the Miramichi Inner Bay ending at the village called the Willows.

It was assumed that blueberries could be established only on the site where this plant was already present. Blueberry promotion over other competitive vegetation would be achieved through management practices e.g. burning and subsequent herbicide (e.g. Velpar) treatment (Blatt et al.,1989). Therefore, common field observation that this plant grew on dry sites along with jack pine served as departure point for establishment of blueberry-tree species relationship that could let us use existing forest cover maps to identify potential sites. Not suprisingly, the New Brunswick Site Classification System (1989, revised by Mike Hayter in 1990) for Cains-Tracadie region associated blueberry the most with jack pine as expressed by so called prominence (square root of %occurence times mean %cover).

The first step was to pull out information on all jack pine stands (not less than 20% of coverage) from Dept. of Natural Resources and Energy Arc/Info (Geographic Information System) data base. In addition, burn areas were also included, for both, blueberry and jack pine, were considered the pioneer species.

All jack pine stands and burns were subsequently marked on the forest cover maps for future reference. It involved over 65 such maps (scale 1:12 500) and around 2 500 sites.

As it was mentioned, blueberry grew on the dry sites only, whereas jack pine could be found even on the wet ones. Furthermore, growing blueberries on wet and/or heavy soils would impede proper soil management. From the future management practices perspective too high slopes would also pose the problem. Thus, the soil drainage (not worse than moderately well), soil texture (not heavier than loam), and slope (not more than 15%) information on jack pine and burn sites was required. There was an available, yet unpublished, soil survey on the Acadian Peninsula on the orthophoto maps in scale of 1:10 000 (soil mapping intensity level 2, Mapping System Working Group, 1981). Some of the marked sites on the forest cover maps had identified soil conditions from this soil survey. However, the region considered was bigger than the area covered by this survey. Hence, less

intense survey (intensity 4) on the topo maps and old white and black air photos, both at the scale of 1:50 000 were used. Lower intensity (higher level number) of soil survey meant lower local accuracy. The probability of assigning a wrong soil attributes to a given stand increased with decrease in soil mapping intensity. Little areas such as some stands (e.g. 5 ha occupied surface of a dime on a 1:50 000 map) could represent an entirely different soil that had not been considered in soil poligon name at the time of soil survey simply because of its minute size. To ammend this it was decided to interpret soil attributes directly from colour 1:12 500 air photos wherever it was felt to be necessary.

Once all jack pine and burn sites were identified in terms of their soil drainage and texture and slopes the information was entered to the computer and formed soil data base. This data base along with overlays (GIS data bases) on forest stands, land ownership, and hectareage constituted a general data base that served to pull out the information according to the objectives of this study. This step was done at the Timber Management Branch (DNR&E) Arc/Info system.

Final product of this project consisted of (i) summarized data on hectareages of potential blueberry fields arranged by land ownership and survey, the latter reflected our confidence level in data, (ii) a list of sites qualified in terms of vegetation (jack pine and burn) and soil (drainage, texture, and slope) arranged by forest cover map, and (iii) a set of forest cover maps with marked sites. The summarized data are presented in the section that follows.

RESULTS AND CONCLUSIONS: In the area determined for the project jack pine stands occupied 8 269 ha and burn 5 342 ha. The area that was left after removing all unsuitable sites because of the soil conditions, amounted to 4 871 ha for jack pine stands and 4 794 ha for burn. These data were arranged according to ownership and soil survey and presented in the following table.

Table. Summary of results.

Soil survey		Ownership	
1:10 000 orthophotomaps	1:50 000 maps and air photos, also interpretation of 1:12 500 air photos	Crown Land	Private
2 956 ha	6 709 ha	3 776	5 301

The majority of the hectareage fell under either a less detailed soil survey or photo interpreted categories that would require further field truthing or some other kind of field confirmation before leasing the land to the prospective farmer.

Most of the sites was in private hands represented by North Shore Forest Products Marketing Board. A fraction of those classified as private was actually in federal hands. The sites on Crown Land were leased to two main licensees in the area, namely Nepisiquit and Lower Miramichi.

As a general comment, this project showed the need for computerizing spatial soil information using a geographic information system. It would allow for quick integration of soil data base with other existing spatial data bases (e.g. forest cover, ownership, highway and rivers etc...) so that the process of gathering material for decision making would not require a three, four months but two weeks.

ACKNOWLEDGMENTS: Thanks are extended to Peter Andrews from Timber Management Branch, N.B.D.N.R.&E. for providing forest related information on sites and summarizing data using The Branch Arc/Info system. Mike Hayter from the same branch is thanked for revision of new forest site classification system for the Acadian Peninsula done especially for this project. Herb Rees and Sherif Fahmy from L.R.R.C., Agriculture Canada are also acknowledged for supplying some important soil information.

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HIGHBUSH AND HALF-HIGH BLUEBERRY PLANTING IN KESWICK RIDGE

S.G. Michaud and D. Carlisle

ABSTRACT: An on-farm demonstration of highbush half-high blueberries was started in 1986 in Keswick Ridge. This project intended to evaluate the feasibility of producing highbush and half-high blueberries for the fresh market.

PLANTATION DE BLEUETS IN CORYMBE ET SEMI-GÉANTS À KESWICK RIDGE.

Resumé: Une démonstration à la ferme de bleuets en corymbe et de bleuets semi-géants a été établie en 1986 à Keswick Ridge. Le projet vise a évaluer la possibilité de produire ces deux types de bleuets pour le marché frais.

Introduction: In 1986, a highbush blueberry plantation was established on Mr. Doug Carlisle's farm in Keswick Ridge. Four different highbush varieties were planted in 1986: Patriot, Northland, Bluecrop and Blueray. The material used was two year old plants, grown in containers in a nursery in Ontario. The blueberries were planted at a 1.5m x 3m spacing for a total area of 0.25 ha. A drip irrigation system was put in place. Plants were mulched the first fall and the area between the rows was left as sod and kept mowed. Removal of fruit buds and dead wood was done in 1986, 1987 and 1988, which were the establishment years. The original plan was to increase the size of the planting each subsequent year, but this has not taken place. In 1989, half-high blueberries were planted on 0.3 hectares.

Discussion: While the field where the blueberries are located is well protected from dominant winds and has an adequate snow cover, the plants still showed signs of winter injury in 1988 and 1989. Other problems encountered were Godronia canker and Black vine weevil. There was also some mouse damage. While very few plants have died, these three factors combined with winter injury have slowed down the development of at least 20% of the plants. Fertility and water requirements were monitored and adjusted accordingly.

The summer of 1989 was the first year of actual berry production. Expected yields should have been between 0.25 to 0.5 kg/plant. While a few plants produced as much as 0.5 kg/plant, most were well below 0.25 kg/plant and many had no fruit whatsoever. Shoot development was good during the 1989 season and it is hoped that a yield of 0.75 kg/plant can be achieved for 1990. There are no plans to expand this planting at this stage.

The half-high blueberries developed well during the 1989 growing season. A decision will be made in the spring of 1990 as to whether or not these plants should be allowed to fruit.

OBSERVATIONS ON CULTIVATED LOWBUSH BLUEBERRY PLANTATIONS IN NEW BRUNSWICK

Serge G. Michaud

ABSTRACT: Cultivated lowbush blueberries have been grown in New brunswick for 10 years. While the enthusiasm originally shown for these blueberries has somewhat diminished, there is still interest, although on a small scale.

OBSERVATIONS SUR LES PLANTATIONS DE BLEUETS NAINS CULTIVÉS AU NOUVEAU-BRUNSWICK.

Résumé: Le bleuet nain cultivé est maintenant au niveau au de plantations commerciales depuis 10 ans. Quoiques cette culture n'occupera probablement jamais la place qu'on lui réservait il y a dix ans, il n'en demeure pas moins que l'intérêt est toujours présent.

DISCUSSION: Cultivated lowbush blueberries were first planted on a commercial scale in New Brunswick in 1979. Between that year and 1983, a total of 50 hectares were planted, either at existing wild blueberry growers or at other producers of horticultural crops who saw potential for blueberries in their operations. Most of the latter were considering blueberries for U-pick and fresh market purposes. While cultivated lowbush blueberries seemed very promising at first, everyone realized that high yields are also tied in with high management. Between 1984 and 1989, only five hectares of cultivated lowbush blueberries were established. All the plant material is still issued from the N. B. Horticulture Centre in Hoyt, N.B,

Ten years after this venture was started, it was decided to assess the situation as to what the future holds for cultivated lowbush blueberries and what results the existing growers have experienced over the years. There is currently 30 hectares left in production in the province with 25 growers. The rest either died from frost heaving, were plowed under due to too many problems or are still alive but not managed. Of this 30 hectares, some plants were used to fill in misses in wild blueberry stands and are not managed as cultivated blueberries.

Management of these cultivated lowbush blueberries is one of the major areas of concern. Most growers who own wild stands soon realized that the cultivated lowbush blueberries needed a lot of special treatment regarding mulch, hand weeding,mowing instead of burning, 3 and 4 year cycles compared to 2 years for wild stands, etc. The rate of success with other horticultural growers proved to be better since they were used to a higher level of management.

Over the last ten years many problems have been encountered. The major one was and still is, weed control. The herbicides currently available are not apt to deal with weeds encountered in a cultivated situation versus a wild stand. And because of the low hectarage involved, major research projects are not realistic. A 3 and 4 year cycle also compounds the problem. So far, insect and disease problems have been few, and adequate control has been achieved using existing material.

As some plantations mature and yields start to increase, more growers realized that the use of bees for pollination, and irrigation to ensure an adequate supply of water is critical. Some growers had to invest in netting to prevent bird damage. This is especially true of small isolated plantations.

Yields are gradually increasing where management is adequate. In a 4 year cycle, the highest yielding year is the second cropping year (year 3). Yields of up to 5000 kg/ha have been realized in small well managed plantations. However, most growers experiencing high yields are also complaining of large amounts of fruit falling off at harvest, especially with U-picks. The ones harvesting for the fresh market also complain about the difficulty of harvesting the fruit without damaging or bruising it. As fields fill in and rows disappear, some growers are asking if there is a way of keeping the growth in a row form.

Another point worth mentioning is the difference of plants issued from seedlings compared to those issued from cuttings. The effect of the variability of seedlings on yields is starting to show. While they are quicker to establish and spread out, yields which were higher in the first few years are now less than with the cuttings. The cuttings also retain this "row" configuration longer. It should be noted that almost all the plant material grown at the horticultural Centre after 1985 was issued from cuttings, and that tendency is continuing.

Only a few plantations have reached the full 7 year stage and even those are still not at maximum production. While cultivated lowbush blueberries will probably never reach the step at which they were forecasted to be ten years ago, they still offer an alternative for growers who want to include blueberries to their U-pick markets. Research is still going on in Kentville to find better clones. There is, however, much interest shown by growers for the half-high blueberry because of its size and ease of management. However, problems encountered with both half-high and highbush blueberries in N.B. leaves, so far, only the cultivated lowbush as an alternative.

It is also important to note that cultivated lowbush blueberries are part of a land reclamation project at the coal strip mining site in Minto. In spring 1989, a total of 4000 cultivated lowbush blueberry plants were planted in Minto (0.2 ha). The site was fertilized and mulch applied. It is usually not recommended to plant blueberries in a soil as poor, as coarse and with such a low organic matter content. This is strictly an experiment to see if blueberries could be a part of a reclamation plan, over a 20 year period. Results of this first planting will be made available through this report in coming years.

HALF-HIGH BLUEBERRY CLONE EVALUATION

B. Dykeman and J. McCully

ABSTRACT: The evaluation of Minnesota half-highbush blueberry clones was continued. Inadequate growth last year coupled with extensive tip die-back are responsible for this year's low productivity. High levels of blueberry canker and witches broom infections continue to reduce the commercial feasibility of this crop in N.B.

ÉVALUATION DE CLONES DE BLEUETS SEMI-GÉANTS

RÉSUMÉ : L'évaluation de clones de bleuets semi-géants de type Minnesota s'est poursuivie. Une piètre croissance l'année dernière ainsi qu'une forte incidence de flétrissement apical sont responsables du faible rendement de cette année. Il y avait également beaucoup de chancres de bleuets et de balai de sorcière, ce qui continue à réduire la rentabilité commerciale de cette culture au Nouveau-Brunswick.

INTRODUCTION: In 1980, nine clonal selections from the Minnesota State University blueberry breeding program; one N.B. selection from a seedling line of Mn3; and Mel, a University of Maine selection were established for evaluation in New Brunswick. All of these clones originated from intraspecific crosses of highbush (Vaccinium corymbosum) and lowbush (V. angustifolium) plants.

MATERIALS AND METHODS: The clones were placed in a randomized block design with four replications. Six plants per plot were used at a spacing of 1.0 m * 2.0 m. The trial was established at the N.B. Horticulture Centre on a riverbank loamy sand. Plants were mulched in the fall of the establishment year with 5 cm of sawdust.

The plots were fertilized each spring with 50 kg/ha of N, P_2O_5, and K_2O and irrigated throughout the season as required, excepting 1987.

The trial was established on new land with low fertility and low soil organic matter. For this reason, growth and establishment was slow. Lack of uniformity in the bushes and extensive witches broom infection led to the decision in spring 1986 to prune severely. The bushes were reduced to six inch stumps and left to recover.

Data of yield, fruit quality and plant growth were recorded from 1983-85, and again in 1987 and 1988. In 1989 only data regarding yield was taken.

RESULTS AND DISCUSSION: Yields across all clones were very low in 1989 due to winter injury to the shoot tips and flower buds. The average yield of 1836 kg/ha was less than 20% of the 1988 average yield of 9401 kg/ha. Clones such as NBBC1, Mn 61, Northblue and Northsky were the least affected by winter injury.

TABLE 1. Performance of half-high blueberry clones in 1989.

Clone	Total Yield (g)	100 Berry wt. (g)	Projected Yield (kg/ha)
Mn 84	1121.2	122.9	934
NBBC1	3697.2	108.7	3081
Mn 354	882.4	110.4	735
Mn 135	1926.0	109.1	1605
Mn 61	3466.0	82.6	2888
Northblue	3838.3	149.5	3198
Mn 327	774.8	70.5	645
Northsky	3383.6	72.9	2819
Mn 330	2671.8	61.6	2226
Me 1	551.7	57.4	459
Northcountry	1977.6	62.7	1648
LSD(p=0.05)	1303.9	12.2	1086

TABLE 2. A comparison of projected yields over the last three years.

Clone	1987 Projected Yield (kg/ha)	1988 Projected Yield (kg/ha)	1989 Projected Yield (kg/ha)
Mn 84	11684	21621	934
NBBC1	10671	16248	3081
Mn 354	9571	14116	735
Mn 135	7425	9862	1605
Mn 61	8796	7696	2888
Northblue	8405	8011	3198
Mn 327	8922	6607	645
Northsky	7044	5656	2819
Mn 330	5485	8013	2226
Me 1	4707	3357	459
Northcountry	5808	2222	1648

HIGHBUSH BLUEBERRY CLONE EVALUATION

B. Dykeman and J.McCully

ABSTRACT: Six highbush blueberry cultivars and one half-high clone are being evaluated for hardiness and adaptability at the N.B. Horticulture Centre, Hoyt. The half-high clone, NBBC1, continues to perform as well as the best highbush cultivars. Extensive winter injury has resulted in very poor yields this year.

ÉVALUATION DE CLONES DE BLEUETS GÉANTS

RÉSUMÉ : Six cultivars de bleuets géants et un clone de bleuets semi-géants ont été cultivés au Centre horticole de Hoyt afin d'établir leur rusticité et leur capacité d'adaptation. Le rendement du clone de bleuets semi-géants NBBC1 continue d'être aussi bon que les meilleurs cultivars de bleuets géants. Le gel a fait d'importants dégâts chez les cultivars de bleuets géants, ce qui a entraîné un mauvais rendement.

INTRODUCTION: Any perennial fruit crop to be grown in this area must exhibit a high degree of winter-hardiness. Using this criteria, six highbush blueberry (Vaccinium corymbosum) cultivars were selected for a cold-hardiness trial, along with one half-high clone (V. corybosum angustifolium) of known cold hardiness and high production capability.

Differential Thermal Analysis (DTA) was performed on bud and stem tissue for two years (1985-86, 86-87) to evaluate relative tissue and bud hardiness. No significant differences between clones were found.

To make the planting more uniform, all fruit buds were pruned in 1986. Some additional pruning was done in the spring of 1987, 1988, and 1989 to remove diseased wood (stem canker and witches broom) as well as winter-killed twigs. Harvest data was gathered in 1987, 1988 and 1989.

MATERIALS AND METHODS: The seven cultivars were planted in a RCBD, with six plants per replication and four replications. Spacing was 1 m * 2 m. The plants are fertilized with 50 kg/ha N, P_2O_5, and K_2O in the spring and irrigated as necessary.

RESULTS AND DISCUSSIONS: Harvest yields were down considerably this year due to extensive winter injury (Table 2). Many of the cultivars experienced tip die-back and this, coupled with inadequate growth last year, contributed to the low productivity. A comparison of the different cultivars this year can be seen in Table 1. The half-high clone, NBBC1, performs as well as any of the top highbush varieties.

TABLE 1. Performance of highbush blueberry cultivars 1989.

Cultivar	Total Yield (g/plot)	100 Berry Wt. (g)	Projected Yield (kg/ha)
NBBC1	944	98.3	786
Northland	1083	109.3	903
Patriot	758	185.1	632
Burlington	47	129.0	39
Blueray	56	136.1	47
Bluecrop	33	185.3	28
Spartan	17	213.2	14
LSD(p=0.05)	871	49.1	726

TABLE 2. A comparison of projected yields over the last three years.

Cultivar	1987 Projected Yield (kg/ha)	1988 Projected Yield (kg/ha)	1989 Projected Yield (kg/ha)
NBBC1	5338	8673	786
Northland	1689	4974	903
Patriot	946	4091	632
Burlington	334	2629	39
Blueray	966	1257	47
Bluecrop	213	1124	28
Spartan	162	906	14

UNHEATED GREENHOUSE LETTUCE TRIALS

Andrew W. Currie

ABSTRACT: Three crops of Parris Island Cos Romaine Lettuce and Ithaca Head Lettuce were sown in succession: March 3, 17 and 31 in a heated greenhouse structure. Transplanting occurred on April 14, April 28 and May 1, respectively in an unheated greenhouse structure. Harvest dates were compared with those of open field production methods. One greenhouse harvest was ten days earlier than normal field harvest and shows some promise as a season extension method.

ESSAIS DE PRODUCTION DE LAITUE DANS DES SERRES NON CHAUFFÉES

RÉSUMÉ : Trois cultures de laitue romaine Parris Island Cos et de la laitue pommée Ithaca ont été semées successivement les 3, 17 et 31 mars dans des serres chauffées. Le repiquage s'est fait le 14 avril, le 28 avril et le 1er mai, respectivement dans des serres non chauffées. Les dates de récolte de ces plants ont été comparées à celles des cultures en pleine terre. Une des récoltes en serres devançait de dix jours la récolte normale de plein champ et pourrait peut-être devenir avantageuse pour prolonger la saison.

INTRODUCTION: The trial was conducted at the NB Horticultural Centre located in Hoyt. The unheated greenhouse was a single layer poly clad structure of 260 metres^2 in area. The greenhouse contained a sandy loam soil with a pH of 6.2.

MATERIALS AND METHODS: The entire soil bed area was fertilized with granular 17-17-17 at the rate of 10 kg per 100 metres^2 as a preplant incorporation. No other fertilizer was applied during the cultural period.

Watering was conducted on a regular basis and applied to the crop by the use of drip tubes placed at 50 cm intervals running the entire length of the greenhouse. The plants were never allowed to wilt.

Ventilation was done by the use of a large 137 cm electrical exhaust fan. The thermostat was set to a level of 24°C. On extremely warm days the ambient temperature rose above that setting. The bulk of the harvesting was completed before high inside temperatures were experienced.

Each individual plant had .07m^2 of growing area, regardless of variety.

Seeding, transplanting and harvesting were conducted on a sequential basis as indicated in Table 1, initial seeding was in a seedling flat, the plants were then placed in 608 cell packs for 4 weeks prior to final transplantation.

While in the 608 cells the seedlings were gradually acclimated by temperature reduction down to a final hardening regime of 5°C. Final transplanting occurred when the seedlings were 6 weeks of age.

Damping off and bottom rot was controlled by applying Ferban 76% W.P. 1.5 kg/1,0000 l on a weekly basis in the seedling flat as a spray. It was applied once after transplanting.

RESULTS AND DISCUSSION: Lettuce growing in the outside environment in New Brunswick is controlled by meteorological changes to a great extent. Unheated greenhouse structures offer growers the opportunity for season extension without the high energy inputs of traditional greenhouse culture and the timely delays of unpredictable rainfall, wind and insect/disease occurrences.

TABLE 1: UNHEATED GREENHOUSE LETTUCE PRODUCTION STUDY, 1989

Variety	Seeding Date	Transplant Date	Harvest Date	Weight (gms)
Romaine	March 3	April 14	June 15	514.4
Head	March 3	April 14	June 15	817.7
Romaine	March 17	April 28	July 4	544.8
Head	March 17	April 28	July 4	467.4
Romaine	March 31	May 1	June 23	581.7
Head	March 31	May 1	June 23	673.5

TABLE 2: TRADITIONAL FIELD LETTUCE PRODUCTION IN CAP PELÉ, NB, 1989

Variety	Seeding Date	Transplant Date	Harvest Date
Romaine	March 21	April 25	June 25
Romaine	April 1	May 6	July 5
Romaine	in field May 16	--	July 30
Head	March 21	April 25	June 25
Head	April 1	May 6	July 5
Head	in field May 16	--	July 30

Table 1 and 2 illustrate the differences in seeding and harvest dates between greenhouse production and field production.

The March 17 seeding and subsequent transplant date of April 28 experienced some severe delay in establishment. This was due to low nighttime temperatures during early May (approximately -2 to -3°C).

The only seeding date which proved to be of benefit to early season harvest during this growing season was the March 3 date. It resulted in a harvest date that was 10 days earlier than the traditional field production system.

The shortest transplant to harvest period was seen in the May 1st transplant date. It was 53 days, and they were one week quicker than any other schedule.

Growers feel that there is definite advantage to having a crop 10 days earlier than the current field harvest date. This would enable the grower to capture a segment of the market period that has been high in value, and so far untapped.

It should be noted that the climatic differences at Hoyt and Cap Pelé are quite different. The former being an inland location the latter being a seaside location. Moderating temperatures found at the seaside location certainly come to play an integral part in outdoor production in the Cap Pelé area.

REGIONAL BEDDING PLANT TRIALS

A. W. Currie

ABSTRACT: 27 species of bedding plant cultivars were evaluated during the spring and summer of 1989 at the New Brunswick Horticultural Centre located in Hoyt. Pack and field evaluations were conducted on plant height, diameters of flowers, amount of bloom and trueness to type. From these readings plants were rated according to scores appointed during the observation periods.

ESSAIS RÉGIONAUX DE PLANTES À REPIQUER

Résumé: Vingt-sept cultivars de plantes à repiquer ont été évalués au printemps et à l'été de 1989 au Centre horticole du Nouveau-Brunswick à Hoyt. Les évaluations de plants en caissettes et de plants en pleine terre portaient sur la hauteur des plants, le diamètre des fleurs, le nombre de fleurs et l'intégrité variétale. À partir de ces indications, les plants ont été classés selon des points attribués pendant les périodes d'observation.

INTRODUCTION: These are ongoing cooperative trials between all four Atlantic provinces. The goal each year is to screen all plant material and identify the exceptional cultivars. This enables the producer and consumer the opportunity to purchase the best plant material available.

Pack evaluations were carried out prior to transplantation (June 6). Field evaluations were carried out on August 16. All plants were grown in 806 plastic cell containers except geraniums, they were grown in 4 inch pots however.

All measurements are in millimetres. Ratings in Table 1 are a total out of 5, in table 2 they are out of 50.

TABLE 1: Pack Evaluation

VARIETY	HEIGHT	% FLOWERING	DIAMETER OF FLOWER	EVENESS OF GROWTH	FOLIAGE APPEARANCE
GERANIUMS					
Orbit Pink	220	17	80	4	5
Rose Diamond	240	50	100	5	5
Orbit Lt.Salmon	230	25	80	4	5
Deep Ringo Scarlet Goldsmith	260	17	65	5	5
Multibloom Scarlet	300	92	90	3.5	5
Applause	230	67	70	3.5	4
Salmon Elite	210	8	50	4	4
Goldsmith Multibloom White	260	25	100	4	4
Red Elite	260	33	90	4	5
Multibloom Scarlet Eye	210	58	90	4	5

Pinto Blush	230	42	100	3.5	4
Elite Pink	180	17	105	3.5	4.5
Sprinter Scarlet	200	0	-	4	3.5
Orbit Glow	250	42	85	3	4
Tiffany	160	0	-	4	4
Deep Salmon	190	17	50	4	5
Neon Rose	160	0	-	5	5
Bandit Red	250	33	100	4.5	5
Picasso	210	0	-	5	5
MARIGOLDS					
AAS Golden Gate	170	80	50	4	2.5
Red Seven Star	220	90	40	3	5
Show Boat	200	80	50	4	5
Super Double Crested Gold Strike	165	55	35	5	4
Super Double Crested Star Dust	185	90	45	5	5
Queen Bee	140	95	35	5	5
Mid-Dwarf Super Double Crested Honeymoon	185	70	35	5	4
Dwarf Calico	180	90	50	4	5
Disco Orange	160	70	40	2	5
Hero Red	165	95	40	5	5
Yellow Jacket	160	70	35	4.5	5
Golden Nugget	160	60	45	3.5	4
Red Nugget	180	80	50	4	5
Familiar Eyes	150	75	35	4	5
Fresh Candy	190	90	50	3	5
Sophia Mixture	195	30	40	3.5	5
Cabaret Orange	180	85	40	4	5
Gold Rush	185	10	35	5	5
Super Double Crested Gold Finch	165	95	45	4	5
Yellow Nugget	170	70	45	3	5
Early Queen Superior	170	80	55	4	4
Scarlet Supia	175	50	50	2	4.5
Tiger Eyes	180	90	30	5	4
Orange Nugget	210	80	40	3	5
Honeycomb French Semi-Dwarf	185	95	50	4	5
Honey Sophia	190	60	45	4	4
Hero Yellow Improved	150	95	50	4.5	4
Joyful	180	80	40	3.5	5
Orange Sophia	190	60	40	4	4
Mid Dwarf & S.C.D. Harvest Moon	185	40	45	3	4
Disco Golden Yellow	145	90	45	5	5
S.D.C. Panther	140	85	35	5	4
Yellow Sophia	190	30	45	4	5
Orange Fireworks	220	55	50	3	5

Red Cherry	175	80	40	3	3.5
ZINNIA					
Pulcino Scarlet Shades	230	0	-	3.5	4
Pulcino Orange Shades	220	0	-	2.5	4
AAS Yellow Marvel	90	0	-	1.5	3.5
Dasher Yellow	130	0	-	4	3
Dasher Cherry	150	0	-	4	4
Scarlet Splendor	155	0	-	3	4
PEPPERS					
AAS Super Cayenne	350	75	15	4	4
AAS Mexi Bell	310	25	10	3.5	3.5
AAS Super Chili	285	90	10	4.5	4
ALYSSUM					
Snow Crystals	80	100	5	3	3
BASIL					
AAS Purple Ruffles	85	0	-	3	5
DAHLBERG DAISY					
Golden Fleece	200	100	15	5	4
WAX BEGONIA					
Ambra Scarlet	70	0	-	4.5	5
Ringo Rose	70	12.5	30	4	5
Ambra Salmon	60	0	-	3	4
Ambra White	65	0	-	4	5
Rum	60	0	-	3	4
Olympia White	45	7.5	35	4	5
Rio Scarlet	50	11	40	3	5
Scarletta	50	0	-	5	5
Gin	35	0	-	3	5
Coco Ducolor	55	12.5	35	4	5
Rio Pink	80	7	30	4	4
Rio Rose	50	11	20	4	4
Scarlanda	80	0	-	3	5
Prelude Scarlet	40	0	-	2	4
Athena Scarlet	55	0	-	2	4
Vision Salmon	65	0	-	3	4
Prelude Rose	45	0	-	3	4
Vision Bright Rose	50	0	-	4	5
Athena Rose	45	4.5	35	4	5
Olympia Bright Rose	35	17	45	3	4
Varsity White	35	6	30	4	3

Bingo Red	25	0	-	3	4
Brandy	50	7	30	3	4
Vision Red	40	0	-	3	4
Varsity					
Deep Rose	25	0	-	3	4
Linda	40	0	-	3	4
Rio White	50	0	-	3	4
Prelude White	55	3	35	3	4
Othello	55	0	-	4.5	5
Olympia Red	50	0	-	4	3.5
Bingo Pink	45	2	25	3	4.5
Ambra Pink	50	0	-	4	5
Whisky	40	0	-	2	4
Ambra Picotee	25	0	-	3	3
Ambra Rose	30	0	-	3.5	4
Varsity Scarlet	35	0	-	2	3.5
Vodka	50	0	-	4	4.5
Prelude Bicolor	45	6	35	3.5	4
Viva	45	0	-	3	5
Olympia Pink	45	0	-	3	4
Varsity Rose	40	26	40	4	5
Alfa Red	45	0	-	3	3.5
Alfa White	35	0	-	3	3.5
DIANTHUS					
Telstar picotee	180	77	30	2	5
Telstar Crimson	160	94	20	2	5
Hyb. Pink Flash	210	95	20	3	3
VERBENA					
AAS Sandy White	225	50	70	3	4
Novales AAS					
Deep Blue White Eye	210	45	60	4	4.5
AAS Trinidad	220	33	60	3.5	5
GAZANIA					
Daybreak Mixed	140	38	55	4	4
Daybreak Bronze	160	38	65	3.5	5
Special Mixture	130	10	45	4	4.5
Grandiflora Mix	170	0	-	3.5	3
Multi-star Yellow	130	0	-	5	3.5
Mini-star Mix	180	25	70	4	4
Mini-star White	195	58	60	5	5
Galaxy Mixed	170	50	40	5	4.5
Daybreak Orange	170	88	55	3	3
Sunshine Mixed	150	0	-	4	3.5
AAS Mini-star					
Tangerine	120	0	-	3	3
Daybreak Yellow	125	62	50	3.5	4

PUMPKIN					
AAS Autumn Gold	130	0	-	3	5
SQUASH					
Sundrops AAS	90	0	-	3.5	3.5
Sunburst AAS	190	0	-	3	4
AAS Cream of the Crop	140	0	-	3.5	4
CUCUMBER					
AAS Salad Bush	70	0	-	2	4
PETUNIAS					
AAS Purple Pirouette	120	92	70	3	4
AAS Polo Burgundy Star	190	100	45	4	3
Polo Red	140	75	55	5	4
AAS Polo Salmon	230	75	55	3.5	5
AAS Ultra Crimson Star	150	70	70	3	3.5
AAS Orchid Daddy	170	89	65	3.5	4
Celebrity Hot Pink	180	90	60	3.5	3
Celebrity White	150	85	60	4	3
TORENIA					
AAS Torenia Clown Mix	180	80	30	4	3.5
SANVITALEA					
Mandarin Orange	180	55	20	2	3
SALVIA					
Scarlet Midget	300	100	40	3	3.5
CELOSIA					
AAS Century Mixed	190	0	-	3	3
AAS New Look	180	0	-	3	3
AAS Pink Castle	140	0	-	3	4
AAS Burgundy Okra	360	0	-	3.5	4
AAS Brandy Okra	300	0	-	4	3
IMPATIENS					
Bodger Tempo Blush	140	85	45	4	3

COSMOS					
AAS Sunny Red	390	4	40	3	3.5
COREOPSIS					
AAS Early Sunrise	170	0	-	4	4
DAHLIA					
Sunny Red	210	1	60	4	4
SNAPDRAGONS					
Liberty Yellow	225	0	-	3	4
Coronet Scarlet	160	0	-	3.5	4
Sonnet Pink	195	0	-	4	5
Coronette Pink	175	0	-	3.5	4.5
Floral Carpet Orchid	165	9	20	3.5	4.5
Floral Carpet Yellow	190	16	30	5	4
Floral Carpet Pink	195	25	25	3	3
Sonnet Orange Scarlet	250	0	-	2.5	3.5
Sonnet Rose	175	0	-	3	4
AAS Princess White with Purple Eyes	185	2	25	2	4
Floral Carpet Rose	150	0	-	4	4
Coronette Yellow	110	0	-	3	4
Coronette Crimson	190	0	-	4	4.5
Floral Carpet White	140	0	-	3	4
Coronette Cream	185	0	-	4	5
Coronette Cherry	120	0	-	3	4
Sonnet Yellow	235	0	-	3	4
Floral Carped Mixed		0	-		
Floral Showers Red & White	190	0	-	2.5	4
Floral Showers Bronze	190	0	-	4	4
Floral Showers Yellow	200	0	-	3	4
Floral Showers Bronze/Yellow	220	6	30	3	4
Floral Showers Crimson	140	95	30	5	4
Floral Showers Pink	200	0	-	3	4
Floral Showers Purple	210	0	-	3	3.5
Coronet White	190	0	-	2.5	5
Floral Showers White	190	0	-	3	4

Coronet Rose	180	0	-	3	4
Sonnet White	205	0	-	4	4
Sonnet Crimson	210	0	-	3	4
Sonnet Bronze	210	0	-	3.5	4.5
Coronette Bronze	180	0	-	3	4.5
Coronette Orchid	220	0	-	3	4.5
Sonnet Carmine	240	0	-	3	4
Floral Carpet Bronze	170	17	25	4	4
Sonnet Burgundy	190	0	-	3	4
PANSY					
AAS Jolly Joker	80	10	40	3	3
CHYRSANTHEMUM					
Snow Lady AAS	75	0	-	3.5	3.5
CARNATION					
Lilliput Scarlet	180	0	-	5	5
Yellow Knight	185	0	-	4	4
Lilliput White	180	0	-	5	5
ACHILLEA					
Summer Pastels	90	0	-	3	3

TABLE 2. FIELD EVALUATION

VARIETY	PLANT HEIGHT	PLANT SPREAD	BLOOM SIZE	RATING	SOURCE
ZINNIA					
Dasher Cherry	24	28	7	37	
Pulcino Pink Shades	33	37	7.5	35	
Scarlet Splendor	57	42	10	34	
Yellow Marvel	33	34	7	33	
Dasher Yellow	19	21	5	33	
Pulcino Orange Shades	27	32	7.5	32	
Pulcino Scarlet Shades	32	33	6	30	

GAZANIA

Galaxy Mixed	21	32	7	43.5
Daybreak Bronze	19	33	7	43
Mini Star White	23	31	7	43
Sunshine Mixed	32	47	10	41.5
Mini Star Mix	28	32	8	40
Daybreak Mixed	21	31	7	39
Daybreak Yellow	20	26	6.5	38
Special Mixture	24	33	7	37
Mini Star Tangerine	21	31	7	37
Mini-Star Tangerine	21	29	7	37
Grandiflora Mix	22	38	10.5	36
Daybreak Orange	22	318	6	36
Mini-star Yellow	23	34	8	36

MARIGOLD

Gold Finch	34	33.5	6.5	51
Tiger Eyes	31	42	5.5	46.5
Gold Strike	29	38	4.5	45
Honey sophia	29.5	38	5.5	44.5
Orange Fireworks	35.5	43	6	44
Golden Gate	32	35	6	44
Goldrush	35	40	5	43.5
Orange Sophia	31	41	5.5	43
Star Dust	33	40	7.0	43
Dwarf Calico	31	36	6.5	43
Golden Gate	31	33	5	43
Honeycomb French	27	43	6.5	42.5
Cabaret Orange	26	35	5.5	42.5
Yellow Sophia	29	36	5	41.5
Queen Bee	30	35	5.5	41
Joyful	34	35	5	40.5
Harvest Moon	40	43.5	7	40.5
Scarlet Sophia	29	31	5	40
Orange Nugget	36	37	5.5	38.5
Disco Orange	26.5	34	5.5	38
Hero Red	29	31	6.5	38
Early Queen Sophia	28	41	6	38
Honeymoon	33	33	5.5	37.5
Disco Golden Yellow	27	32.5	5.5	37
Yellow Jacket	27.5	40	5	36
Red Cherry	30	35	6	35
Showboat	30.5	36	6	34.5
Yellow Nugget	30	44	5.5	34
Hero Yellow Improved	22	28	5	33.5

OKRA

Blondy	41	33	13	37
Burgundy	57	33	18	40

SWEET CORN				
Honey'n Pearl	140	100	-	26
CORN: AAS				
How Sweet It Is	150	95	-	28
SQUASH:AAS				
Sundrops	27	47	11	40
Sunburst	24	78	15	38
Cream of the Crop	45	85	12	37
PUMPKIN				
Autumn Gold	32	175	16	39
DAHLIA				
Sunny Red	47	34	6.5	36
TORENIA				
Clown Mixture	13	17	2	26
CUCUMBER				
Salad Bush	24	100	23	42.5
BASIL				
Purple Ruffles	29	30	-	26.5
LETTUCE				
Red Sails	25	38	-	27.5
BEAN				
Derby	55	65	17	46
PEPPER				
Mexi Bell	43	30	10	46
Super Chili	27	38	5	43.5
Super Cayenne	37	38	6	42

PETUNIA				
Polo Salmon	28	53	6.5	46.5
Super Double Crested Panther	30	38	7	43
Celebrity Hot Pink	34	40	6.5	42.5
Red Seven Star	35	40	6.5	41.5
Polo Red	33	50	6.5	41
Purple Pirouette	30	60	8.5	41
Celebrity White	35	45	6.5	39
Sophia Mix	31	27	5.5	38.5
French Candy	31	45	5.5	38
Ultra Crimson Star	25	47	8	33
Orchid Daddy	21	35	7.5	33
Golden Nugget	23	44	6	32
Polo Burgundy Star	17	26	5.5	26
VERBENA				
Trinidad	20	32	5.5	46
Sandy White	21	28	6	43
Novalis Deep Blue	19	29	4.5	40
IMPATIENS				
Tempo Blush	7	27	4.5	36
Tango	18	33	6.5	32
CELOSIA				
New Look	38	29	7	44
Pink Castle	23	26	7	42.5
CELOSIA PLUMOSA				
Century Mixed	36	36	6	41.8
COSMOS				
Sunny Red	37	29	5	29
DIANTHUS				
Telestar Picotee	28	28	3.5	41.5
CARNATION				
Lilliput Scarlet	23	28	4.5	34.5
Lilliput White	19	25	4.5	33
Yellow Knight	35	39	5	24

DAISY				
Dalhberg (Golden Fleece)	24	35	2	40
ALYSSUM				
Snow Crystals	17	35	2	46
DIANTHUS				
Telestar Crimson	32	30	3.5	47.5
Hybrid Pink Flash	30	30	2.5	31.5
SALVIA				
Scarlet Midget	26	26	4.5	42
SNAPDRAGON				
Floral Showers Pink	21	32	3.5	48.5
Coronette Orchid	38	34	7.5	48
Floral showers White	22	31	4	46.5
Coronette White	47	36	7.5	46
Coronette Cherry	41	31	8	46
Liberty Yellow	43	37	6.5	45
Coronette Bronze	45#	36	9	44.5
Coronette Pink	43	37	7.5	44
Sonnet Carmine	41	33	8	44
Sonnet Crimson	45	46	8	43.5
Floral Showers Purple	19	25	3.5	43
Coronette Yellow	40	39	7.5	42.5
Coronette Crimson	42	32	8	42.5
Floral Carpet Yellow	26	40	3	42
Floral Carpet Pink	26	32	3	41.5
Floral Showers Bronze	21	29	3.5	40.5
Princess White with Purple Eye	28	35	5.5	40
Coronette Rose	39	36	8	40
Sonnet Pink	37	32	7	40
Floral Showers Yellow	16	28	3.5	39.5
Sonnet Burgundy	41	34	8	39.5
Sonnet White	44	36	8	39
Prelude Scarlet	12	15	2.7	39
Floral Carpet White	28	38	3.5	39
Sonnet Rose	40	35	7	38.5
Brandy	12.5	18	2.3	38
Floral Showers Bronze Yellow	21	23	3.5	38
Floral Carpet Bronze	22	30	3	38
Floral Carpet Rose	20	35	3.5	38
Floral Carpet Orchid	22	33	3.5	38.5
Floral Showers Crimson	13	24	3	37

Athena Scarlet	15	25	4	35
Floral Showers Red/ White Throat	16	25	3.5	34
Coronet Scarlet	46	32	7.5	34
PANSY				
Jolly Joker	25	32	5	42
SANVITALIA				
Mandarin Orange	29	60	2.5	44.5
GERANIUM				
Deep Ringo Red	44	40	9.5	43
Sonnet Yellow	45	32	8	43
Deep Salmon (Orbit)	35	33	10	41
Sonnet Bronze	41	31	8	43
Sprinter Scarlet	45	39	10	41.5
Pinto Blush	40	35	9.5	40.5
Floral Showers Crimson	16	24	3.5	40.5
Orbit Light Salmon	35	35	10	39.5
Sonnet Orange Scarlet	39	26	7	39.5
Applause	27	32	9	36.5
Goldsmith Multibloom Scarlet	30	35	9.5	35.5
Bandit Red	35	34	10	35.5
Rose Diamond	29	35	9	35
Multibloom White	37	38	10	29
COREOPSIS				
Early Sunrise	41	42	5	40
ACHILLEA				
Summer Pastels	39	28	7	33
CHRYSANTHEMUM SHASTA DAISY				
Snow Lady	20	20	7	28
BEGONIA				
Prelude White	17	22	2	46.2
Prelude Bicolor	16	22	2	43
Alfa Red	20	24.5	3.2	43
Olympia Pink	17	23	4	42.5
Olympia Red	19	20.5	4	42.5

Scarlanda	16	24	3.2	42.5
Bingo Rose	24	31	4.3	42.5
Varsity White	15	24	2.5	42
Varsity Rose	19	26.5	3.8	42
Whisky	18	26	2.5	42
Ambra Pink	17	22	2.2	41.5
Vodka	16	23	2.9	40.5
Othello	19.5	20	3.6	40.5
Vision Red	17	22	3.5	40
Rio Pink	16	21	3.4	39.5
Vision Salmon	23	27	3	39.5
Gin	18	22	3	39
Rio Scarlet	19	21	3	39
Varsity Scarlet	20	26.5	4	39
Olympia White	22.5	29.5	3.2	38.5
Ambra Scarlet	20	21	2.7	38.5
Coco Ducolo	20	23	3	38
Bingo Pink	19	22	4	38
Ambra Rose	17	22.5	3	38
Olympia Bright Rose	15	20	3.5	38
Rio Rose	15.5	14	2.4	38
Scarletta	13.5	20	4	37.5
Vision Bright Rose	18	24	3	37.5
Athena Rose	20	22	3.2	37
Rum	19	22	2.3	37
Varsity Deep Rose	16	24	3.5	37
Bingo Red	17.5	24	3.2	36.5
Viva	17	29	3.5	36.5
Lynda	21	23	3	36
Ambra Salmon	12.5	20	3.5	36
Alfa White	18	19	2.5	35
Rio White	15	19	2.5	34.5
Ambra White	17	27	2.7	32.5
Prelude Rose	14	18	2.5	31

EARLY SEASON BROCCOLI & CAULIFLOWER TRIAL

G.E. Chevrier & L. Rankin

ABSTRACT: Thirteen broccoli and eight cauliflower cultivars were evaluated for early season production at three locations: Maugerville, Young's Cove & Sussex. All thirteen broccoli cultivars performed well at each site, many displayed characteristics of small bead size and tight heads. The sequence for time to maturity among cultivars followed the same general trend at each site, however certain quality traits like hollow stem and leafiness varied with location. Three of the cauliflower cultivars (White Cloud, Candid Charm & Snowflower) displayed desirable early season traits of good wrapper leaf development and curd quality. CV. White Bishop, a cultivar with less developed wrapper leaves also performed well.

ESSAI DE VARIÉTÉS HÂTIVES DE BROCOLI ET DE CHOU-FLEUR

Résumé: Treize cultivars de brocoli et huit cultivars de chou-fleur ont été évalués pour leur précocité à trois endroits de la province: Maugerville, Young's Cove et Sussex. Les treize cultivars de brocoli ont donné de bons résultats à chaque endroit, et nombre d'entre eux étaient caractérisés par la petitesse des grains et la densité des inflorescences. En général, le temps de mûrissement des cultivars a été le même à chaque endroit, mais certaines caractéristiques comme la tige creuse et les tiges dénuées de feuilles variaient selon l'endroit. Trois des cultivars de chou-fleur (White Cloud, Candid Charm et Snowflower) ont révélé des caractéristiques désirables pour une variété hâtive, comme le développement de feuilles protectrices de la pomme et la qualité de l'inflorescence. Les cultivars de la variété White Bishop, dont les feuilles ne protègent pas complètement l'inflorescence, ont également donné un bon rendement.

INTRODUCTION: In recent years, interest in the production of cauliflower and broccoli has increased. At the same time, the number of available cultivars has grown; many of them being early maturing, uniform in growth habit and of excellent quality. This can sometimes make selection among cultivars difficult.

Since cultivar performance can vary according to region, a trial was set up to evaluate the response of cauliflower and broccoli cultivars at three locations.

The selection included cultivars with potential for early market production.

MATERIALS & METHODS: Thirteen broccoli and eight cauliflower cultivars were evaluated at three sites in N.B. Maugerville (Interval soil); Young's Cove (loam soil) and Sussex (loam soil). All trials were transplanted using seedlings 5-6 weeks of age between May 10 and May 24: Young's Cove site - broccoli, May 10 & cauliflower May 16; Sussex site - May 19; & Maugerville - broccoli May 23 & cauliflower May 24.

The trials were laid out using a randomized complete block design with single line replicates. Four replicates were used. Plant spacing within the row was 16 inches (40 cm) with 36 inches (90 cm) between rows. Prior to planting, the sites were fertilized with 150 to 175 kg/ha nitrogen. Phosphorous and potassium were applied as

TABLE:1 Harvest data for broccoli cultivars grown at three locations - Values represent the mean of 4 replicates.

CULTIVAR	Maugerville		Young's Cove		Sussex	
	Head Wt. (g)	Diameter (cm)	Head Wt. (g)	Diameter (cm)	Head Wt. (g)	Diameter (cm)
Green Valiant	487.65a*	13.62 bc	302.29 b	12.19 bc	362.11a	16.82 b
Emperor	467.63ab	14.60ab	257.26 bc	10.94 d	343.28ab	18.11 b
Zeus	448.77ab	14.60ab	257.27 c	12.00 bcd	359.76a	18.17 b
Cruiser	428.03 b	14.98a	263.68 bc	12.31 bc	284.85 bcd	16.89 b
Green Top	425.26 b	14.30ab	236.84 cd	11.49 bcd	340.11ab	17.68 b
Premium Crop	423.92 b	14.14ab	273.43 bc	11.76 bcd	325.57abc	16.19a
Pinnacle	421.43 b	13.68 bc	344.32a	13.47a	336.15abc	16.94 b
Cape Queen	411.68 b	15.01a	202.37 de	11.40 cd	284.32 bcd	15.69 b
Mariner	331.55 c	12.07 de	201.94 de	11.32 cd	283.23 bcd	16.11 b
Sprinter	313.72 c	12.52 cde	211.12 de	11.26 cd	287.21 bcd	15.50 b
Paragon	291.18 cd	12.74 cd	194.90 de	12.69ab	-	-
Goliath	248.77 d	11.82 de	180.30 e	11.73 bcd	255.51 d	14.69 b
Improved Comet	247.73 d	11.33 e	177.68 e	11.76 bcd	268.85 cd	14.96 b

*Means separation within columns by Duncan's Multiple Range Test (P=0.05)

TABLE: 2 Time to 50% harvest of broccoli cultivars grown at three locations. Values in brackets represent actual number of days from transplant to 50% harvest, based on the mean of 4 replicates.

CULTIVAR	LOCATION		
	Maugerville	Young's Cove	Sussex
Pinnacle	July 17 (55)	July 11 (62)	July 18 (60)
Sprinter	July 13 (51)	July 2 (53)	July 10 (52)
Cruiser	July 17 (55)	July 9 (60)	July 14 (56)
Premium Crop	July 17 (55)	July 6 (57)	July 14 (56)
Green Valiant	July 17 (55)	July 9 (60)	July 18 (60)
Emperor	July 13 (51)	July 4 (55)	July 14 (56)
Paragon	July 10 (48)	July 2 (53)	-
Zeus	July 13 (51)	July 6 (57)	July 14 (56)
Cape Queen	July 17 (55)	July 4 (55)	July 14 (56)
Green Top	July 13 (51)	July 2 (53)	July 14 (56)
Goliath	July 10 (48)	July 4 (55)	July 10 (52)
Improved Comet	July 7 (45)	June 29 (50)	July 7 (49)
Mariner	July 10 (48)	July 2 (53)	July 10 (52)

Among cultivars, Improved Comet, Mariner, Paragon, Sprinter and Goliath were consistant for earliness (50% harvest) at all locations (Table 2). Given the distance between test sites and time spread between planting dates (May 10 to 23) these results indicate that the cultivars were reliable for maturity.

Market quality characteristics recorded at harvest for each cultivar (Table 3) outline differences that were noted among locations. For example, the incidence of hollow stem at the Maugerville site was much higher than at other sites. While almost every cultivar displayed hollow stem at Maugerville, only cvs. Cape Queen, Green Top & Goliath displayed significant levels at all three sites. These differences may be related to soil fertility, soil moisture content or temperatures during

TABLE 3: Cultivar & Market Quality Characteristics of Broccoli

Cultivar	Cultivar Characteristics*			Market Quality Characteristics**								
	Bead size	Yellow Eye	Compactness of Head	Percent Hollow Stem			Percent Bolting			Leafiness		
				Loc.1	Loc.2	Loc. 3	Loc.1	Loc.2	Loc.3	Loc.1	Loc.2	Loc.3
Pinnacle	1	2	1	31	0	0	0	0	0	***		
Sprinter	3	2	2	26	0	6	4	0	0			
Cruiser	2	2	1	26	4	2	0	0	0			
Pr.Crop	2	2	1	64	0	0	0	0	0			
Gr. Val.	1	2	1	24	0	0	0	0	0			
Emperor	2	2	1	53	9	2	0	0	0		***	
Paragon	2	2	2	94	44	0	2	0	0			
Zeus	1	2	1	48	6	6	0	0	0	***	***	
Cape Q.	3	2	2	89	16	13	2	0	5	***		***
Green Top	1	2	1	73	26	16	0	0	4			
Goliath	3	2	2	88	43	37	0	0	2			
Imp.Comet	3	1	2	79	2	40	2	0	2			
Mariner	3	2	2	0	0	0	0	0	10			

*Based on average characteristics of crops at Maugerville site. Bead size rate 1-5 (small to very large). Yellow eye rated 1-5 (Not apparent to severe). Compactness rated 1-5 (very tight to loose).
**Market Quality Characteristics compared at all sites; loc.1 = Maugerville; Loc.2 = Young's Cove; Loc.3 = Sussex.
***Greater than 10% of crop with excessively leafy heads.

head development. In most cases, crop development (based on time to 50% harvest) at Maugerville was most rapid. Percent bolted plants was not a major factor at any of test sites. Excessive head leafiness was observed in Zeus and Cape Queen at two of the three locations.

Cultivar characteristics (head size, yellow eye, compactness) were noted at the Maugerville location. A number of cultivars produced nice compact heads with small bead size. Yellow eye was not severe in any of the cultivars tested.

Cauliflower: data from the cauliflower trial are difficult to interpret because of the large differences noted among locations as far as percent marketable heads was concerned (Table 4). The highest percent marketable heads for most cultivars was obtained at the Maugerville location. Extensive damage caused by deer to young plants was a major factor at the Young's Cove location while poor wrapper leaf development and subsequent off-color development in the curds contributed to losses in all locations. Based on visual observations, cvs. White Cloud, Candid Charm & Snowflower were rated as having good to very good wrapper leaf development. These cultivars ranked among the highest for percent marketable yield. Other factors that led to reduction in marketable yield at all sites included riceyness caused by high temperatures during curd formation & insect damage to the curds caused by tarnished plant bug.

TABLE 4. Percent Marketable Heads (% of total plants/cultivar) of cauliflower grown at three locations.

CULTIVAR	LOCATION		
	MAUGERVILLE % Marketable	YOUNG'S COVE % Marketable	SUSSEX % Marketable
White Cloud	96	30	37
White Bishop	88	43	71
Candid Charm	81	16	54
Snowflower	69	9	27
White Magic	56	48	19
Early White Hybrid	50	34	37
Hybrid Majestic	35	48	23
Alert	29	43	38

The low percent marketable heads in certain cultivars should be kept in mind when considering the harvest data (Table 5 & 6). For

TABLE: 5 Harvest data for cauliflower cultivars grown at three locations. Values represent the mean of 4 replicates.

CULTIVAR	Maugerville		Young's Cove		Sussex	
	HEAD WT. (g)	DIAMETER (cm)	HEAD WT. (g)	DIAMETER (cm)	HEAD WT. (g)	DIAMETER (cm)
Candid Charm	1212.49a*	15.70ab	776.46a	17.32ab	910.64ab	17.29 c
Snowflower	1059.70ab	14.97ab	NA	NA	752.50 bcd	17.54 c
White Cloud	1044.36ab	15.63ab	775.83a	18.07a	715.52 cd	16.72 c
White Magic	962.55 bc	18.82a	NA	NA	768.44 bcd	20.31 b
Early White	860.96 bc	18.83a	687.93a	14.99b	778.29 bcd	21.39ab
Hybrid Majestic	854.85 bc	17.54a	651.59a	16.84ab	944.38a	22.60a
White Bishop	812.61 c	15.25ab	794.73a	15.85ab	853.80abc	21.56ab
Alert	483.73 d	11.85 b	804.99a	16.45ab	662.23 d	20.23 b

*Means separation within columns by Duncan's Multiple Range Test (P=0.05)

TABLE 6: Time to 50% harvest of cauliflower cultivars grown at three locations. Values in brackets represent the number of days from transplant to 50% harvest, based on the mean of 4 replicates.

CULTIVAR	LOCATION		
	Maugerville	Young's Cove	Sussex
White Bishop	July 17 (54)	July 14 (59)	July 18 (60)
Alert	July 17 (54)	July 19 (64)	July 14 (56)
Candid Charm	July 28 (65)	July 19 (64)	July 21 (63)
Hybrid Majestic	July 17 (54)	July 11 (56)	July 14 (56)
Early White	July 13 (50)	July 11 (56)	July 14 (56)
White Cloud	July 24 (61)	July 19 (64)	July 21 (63)
Snowflower	July 24 (61)	July 24 (69)	July 21 (63)
White Magic	July 13 (50)	July 11 (56)	July 14 (56)

example Snowflower had an average head weight of 1059.7g (at 69% marketable heads) at Maugerville while White Bishop produced a lighter head (812.61g) but at an 88% marketable yield level. Between locations the same considerations must be made. For example, White Cloud was high yielding at Maugerville & Young's Cove however percent marketable yields (Table 4) were 96% & 30% respectively.

Quality observations of marketable curds indicate that most cultivars were relatively free of green leaf development (Table 7). Curd colour for the most part was white cream to creamy, cv. White Magic produced the whitest curd of all. All eight cultivars rated tight in compactness of marketable heads however quality differences were noted for pubescence with cvs. White Bishop & Snowflower rating highest in this category.

CONCLUSION: The results of this trial indicate that broccoli cultivar characteristics can vary with plantings in different regions. This was illustrated by the very high incidence of hollow stem at only one of three sites in the evaluation. As well, head leafiness was noted in four different cultivars, however this problem was noted at only one or two of the test sites. Despite these differences, the same trend for cultivar maturity (time to 50% harvest) was noted over the three sites.

TABLE 7: Cauliflower quality observations (from marketable heads) summarized from data recorded at the Maugerville trial site.

CULTIVAR	LEAFINESS	QUALITY CHARACTERISTICS* COLOUR	PUBESCENCE	COMPACTNESS
White Cloud	2	2-3	2	1
White Bishop	1	2-3	3	2
Candid Charm	2	2-3	1	1
Snowflower	2	3	3	2
White Magic	1	2	2	2
Early White Hybrid	1	2-3	2	2
Hybrid Majestic	1	2-3	2	2
Alert	1	2-3	2	2

*ranked on a range of 1 to 5

eg.	Leafiness	1= no leaves in curd	5= unsaleable
	colour	1= white	5= unmarketable yellow
	Pubescence	1= absence of hairs	5= severe
	Compactness	1= tight curd	5= excessively loose

Most of the broccoli cultivars produced compact heads with a small to medium bead size. Cvs. Green Valiant & Green Top produced heads with exceptionally small beads. Cvs. Mariner & Goliath had the largest bead size. From the observations of this trial, all of the tested varieties were suitable for early season production.

Four of the eight cultivars tested (White Cloud, White Bishop, Candid Charm & Snowflower) performed well under the conditions of the trial. All of these cultivars, with the exception of White Bishop, displayed good wrapper leaf development which is a desirable trait sometimes lacking in early season types.

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determined by soil test. Harvesting was done every 4-5 days. At harvest, head weight and diameter were recorded. Quality ratings were given to each cultivar.

RESULTS & DISCUSSIONS: Broccoli: Tables 1 & 2 outline the yield components and relative time to maturity (50% harvest) of the cultivars tested. Head weight and diameter measurements of broccoli are subjective since weight and size increase are quite rapid on a day-to-day basis. Nevertheless there appears to be a trend at all three locations with Mariner, Sprinter, Paragon, Goliath and Improved Comet producing lighter heads. Head weight and head diameter were not always related. For example, Improved Comet, Goliath, Paragon and Mariner produced more slender main stems that influenced overall weight. Head diameter at harvest varied according to producer preference. At Young's Cove, a smaller head was marketable for early season roadside stand sales whereas a larger head was preferred by the Sussex location.

MULCHED CUCUMBER TRIAL - Hoyt, N.B.

G. Chevrier, L. Rankin & G. Read

ABSTRACT: Marketmore 76 cucumber was direct seeded into 7 different mulch treatments and bare soil control. All mulch treatments increased soil temperatures and seedling emergence, especially brown and light brown photodegradable plastics and red plastic. Although soil warming benefits were noted with Polysar and charcoal treatments (soil darkening agents) the effect was short lived as these materials washed away by late July. Yields were significantly increased with black plastic and both types of photdegradable plastic. Yield reductions were noted in the red plastic and light brown photodegradable treatments as these materials faded in colour and weed growth under the plastic increased.

ESSAI DE CULTURE DE CONCOMBRES SOUS PAILLIS - HOYT (N.-B.)

Résumé: Des concombres de la variété Marketmore 76 ont été semés sous sept différents paillis et dans un dispositif témoin non paillé. Tous les paillis ont eu pour effet d'accroître la température du sol et d'accélérer la levée des semis, principalement les paillis de plastique photodégradable brun et brun pâle et les paillis de plastique rouge. Les traitements au Polysar et au charbon de bois (agents de noircissement du sol) ont favorisé le réchauffement du sol, mais leur effet a été de courte durée puisqu'ils avaient été lessivés avant la fin de juillet. Le rendement a été bien meilleur avec le plastique noir et les deux sortes de plastique photodégradable. Une baisse de rendement a été enregistrée avec le paillis de plastique rouge et le film photodégradable brun pâle, car ces matériaux ont déteint et permis la pousse des mauvaises herbes sous le plastique.

INTRODUCTION: Mulching materials have been used for many years as a means of providing weed control, soil moisture retention and soil temperature modification. Today in commercial vegetable production, mulching practices involving plant materials have been replaced by the use of plastic films. However as the use of plastic grows each year, their disposal becomes more of an environmental concern.

In this trial, a range of mulching materials were evaluated in comparison to standard plastics available on the market. Since many of these newer materials are photodegradable (broken down by UV light) it is hoped that they will have less of an impact on the environment while being equally beneficial to crop production.

MATERIALS & METHODS: Cucumber seeds (cv. Marketmore 76) were sown on June 6 into one of seven mulch treatments or bare soil. The mulch treatments included: three plastic films supplied by Leco Films (Standard 1.1 mil black plastic, brown 1.1 mil photodegradable plastic and light brown 1.1 mil photodegradable plastic); red plastic film that was substituted for a cornstarch based biodegradable film (St. Lawrence Starch Co.) that was not available at the time of planting; granular activated charcoal (soil darkening agent) applied at a rate of 0.3L per m^2; Polysar (BASF) photodegradable latex spray applied at 122 mL/m^2; and a mixture of Polysar and activated charcoal applied in a liquid slurry (9 L water: 1 L Polysar: 1 kg charcoal).

The treatments were applied using a randomized complete block design with 4 single line replicates. Within the row plants were spaced at 30 cm (15 plants per row) with an inter row spacing of 1 meter. All film mulch strips and spray on treatments were applied in 1 metre bands. Soil temperatures were monitored for 52 days at a depth of 10 cm for all treatments except red plastic.

Prior to planting the site (loamy sand) was limed for pH adjustment (6.2 pH) and fertilized with 4 tonnes/ha cow manure and 400 kg/ha of 10-10-10. During the trial, observations were made on seedling emergence, soil temperatures and various yield components. The harvest period started on Aug. 10 and finished on Sept. 7 after the first killing frost. Harvesting was done every 2 days.

RESULTS & DISCUSSION: Mulch treatments had a marked influence on soil temperatures early in the trial. Temperature readings taken over a 24 hour period at ten days after planting (Table 1) show that all mulch treatments increased soil temperature when compared to the control. The highest soil temperatures were recorded under the light brown (slightly transparent) photodegradable plots which also maintained the highest over-night soil temperatures. Soil Temperature under light brown photodegradable plastic at 1800 hours was substantially higher than those of conventional black plastic and brown photodegradable, illustrating the amount of heat absorbed by darker colored materials that is not transmitted to the soil.

TABLE 1: Soil temperatures (^{0}C) under mulched and non-mulched treatments, taken at a depth of 10 cm on June 17 (10 days after planting).

TREATMENT	TIME OF DAY				
	2400 hrs.	600 hrs.	1200 hrs.	1800 hrs.	2400 hrs.
Control	16.0	12.3	13.3	22.0	18.5
Charcoal	17.2	12.2	13.7	25.8	20.7
Polysar	18.4	12.7	13.9	27.7	22.4
Black Plastic	19.6	15.1	15.5	25.8	23.4
Photodeg(Brown)	19.1	14.5	15.6	26.0	22.7
Photodeg(Lt.Brown)	22.6	16.1	17.3	33.1	26.8

The soil temperature below Polysar exceeded that of black plastic in late afternoon; the temperature under charcoal was the same as black plastic. This indicates that a dark material (most soil darkening agents) that bonds closely to the soil can have an equal if not a greater heating effect than plastic film which does not have uniform contact with the soil surface. However as the growing season progresses and soil darkening agents get washed away or breakdown, the soil warming advantage over black plastic is reduced as can be seen in Table 3.

During the 1989 growing season, the first 3 weeks of June were quite cool and rainy. Many growers reseeded cucumber crops after seedlings failed to emerge. The influence of higher soil temperatures under the different mulch treatments evaluated in this trial is reflected by the observed seedling emergence (Table 2) at 2 and 3 weeks after planting. Percent seedling emergence was higher when soil temperature was increased as a result of the mulch treatments. A visual comparison of seedling size at the time of thinning, three weeks after seeding (Plate 1) follows the same pattern. As indicated in Table 2, red plastic clearly outperformed all other treatments. Unfortunately the soil temperature readings under red plastic are not available.

TABLE 2: Cucumber seedling (cv. Marketmore 76) emergence at 2 and 3 weeks after planting into various mulching materials. Each value represents the mean of 4 replicates.

Treatment	% Seedlings Emerged	
	2 wk. after planting	3 wk. after planting
Control	43	45
Charcoal/Polysar	48	50
Polysar	62	63
Black Plastic	63	63
Charcoal	62	65
Photodegradable(Brown)	68	68
Photodegradable (Lt.Brown)	78	78
Red Plastic	83	92

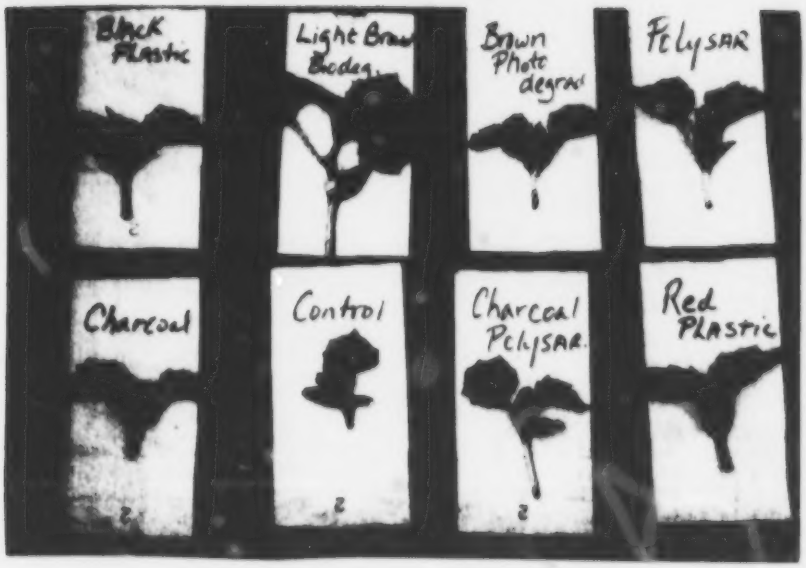

Plate 1: Comparison of seedling size three weeks after seeding.

Table 3 contains the logged temperatures under the treatments 30 days after planting. At 30 days, the temperature differences between bare soil control and the soil darkening agents (charcoal, charcoal/Polysar & Polysar) were negligible due mainly to wash out or breakdown of the products. Again light brown photodegradable mulch and had the highest temperatures over the selected 24 hour period. By this time the colour of the light brown photodegradable mulch had faded. Both photodegradable materials showed signs of breakdown around the edges where they were buried in the soil, becoming brittle and starting to shred.

TABLE 3: Soil temperature (^{0}C) under mulched and non-mulched treatments, taken at a depth of 10 cm on July 7 (30 days after planting).

TREATMENT	TIME OF DAY				
	2400 hrs.	600 hrs.	1200 hrs.	1800 hrs.	2400 hrs.
Control	18.0	15.4	17.7	23.9	21.6
Charcoal	17.5	14.4	17.1	24.5	21.5
Polysar	18.0	14.7	17.1	24.5	21.7
Black Plastic	20.1	16.8	18.5	25.0	23.0
Char./Polysar	18.0	15.0	17.6	24.8	21.8
Photodeg.(Brown)	19.2	16.5	18.6	25.0	23.0
Photodeg.(Lt. Brown)	22.8	18.2	20.3	30.5	26.2

Season harvest totals (Table 4) show that both photodegradable mulches and black plastic yielded significantly higher numbers and weights of grade A fruits when compared to all other treatments. Light brown photodegradable mulch treatments yielded lower than the brown and black mulches despite the higher soil temperatures recorded earlier in the trial. One reason for this was the excessive weed growth that was noted under the light brown mulch. As the season progressed and the colour of the material faded,the weed competition became more severe due to increased light transmission. The same could be said for the red plastic treatment which had the highest percent germination rating (Table 2) however the crop yields were significantly reduced. Herbicide application at the site prior to planting would not have changed the results since the problem weed, purslane cannot be controlled by the herbicides registered for use in cucumber. Purslane was also a problem in all plots treated with soil darkening materials. Grade A yields of control, charcoal and Polysar plots were possibly affected by the warm dry conditions of late July &

TABLE 4: Harvest weights(g) and fruit/plant by grade of cucumber (cv. marketmore 76) grown in various mulch treatments. Each value represents a mean of 4 replicates.

TREATMENT	# of Grade A fruit/pl	Wt(g) of Grade A fruit/pl	# of Grade B fruit/pl	Wt(g) of Grade B fruit/pl	# of Cull fruit/pl	Wt(g) of cull fruit/pl
Photodeg (brown)	5.35a	1843.45a	2.08a	423.35ab	1.90 a	348.50a
Black Plastic	5.05a	1762.88a	1.65abc	406.68ab	1.60a	242.03ab
Photodeg. (Lt.brown)	4.48a	1643.40a	1.80ab	486.10a	2.18a	342.33ab
Red Plastic	2.48 b	849.35 b	1.03 bc	423.68ab	1.58a	262.23abc
Char/Polysar	2.23 b	752.65 b	1.15abc	281.68ab	1.58a	214.38abc
Charcoal	2.10 b	709.63 b	1.48abc	344.10ab	1.15a	161.43 c
Polysar	1.78 b	635.15 b	0.73 c	157.75 b	1.28a	173.95 bc
Control	0.55 b	186.55 b	0.83 bc	194.08 b	1.43a	173.10 bc

Within columns value followed by the same letter are not significantly different at the 0.05 level (Duncan's Multiple Range Test)

early August since these treatments would not have the soil moisture retention benefit (especially on sandy soil) of the plastic films.

In addition to higher yields, the photodegradable plastic treatments were first to yield on August 10; four days before black plastic, red plastic and activated charcoal treatments; six days before the Polysar & Polysar/Charcoal treatments; and 11 days before the control.

The number of Grade B Fruits harvested per plant followed the same trend as Grade A, however only the brown photodegradable mulch yielded significantly higher numbers than the Polysar, red plastic and control treatments. Grade B fruits were selected out because of slight imperfections (skin abrasions and irregular shape) but were still classified as saleable. The number of cull fruits (not marketable due to severe skin markings and crookedness) was not significantly different among treatments.

CONCLUSIONS: Early season advantages of increased seedling emergence and soil temperatures were noted for all mulch treatments over the control. The beneficial effects of all soil darkening agents (charcoal, polysar, charcoal/polysar) decreased during the growing season because of washout or degradation. Even Polysar spray mulch, which was applied at twice the recommended rate, showed soil temperatures only slightly above those of the control plot thirty days after seeding. However, the early season benefit of these soil binding treatments should not be overlooked. Given more conducive weather conditions they would likely exhibit more potential than observed under the conditions of the 1989 growing season. These materials are not designed as season long mulches. Rather they promote early plant development with subsequent benefits at harvest.

The trail illustrated the importance of colour stabilization of plastic films. The advantages of higher soil temperatures and seedling emergence under the red and light brown photodegradable plastics were not carried through to harvest because of colour fading and subsequent weed/crop competition. Perhaps under more favourable growing conditions, plant growth and vine runnering over the plastic would have been more developed thereby shading the soil and inhibiting weed growth.

Under the conditions of this trial, plastic films outperformed soil darkening agents. Both photodegradable materials had reached the stage of breakdown where they could be disced under at the end of the growing season.

Future work in the area of mulch treatments should include new materials to be released in the near future. For example, improved photodegradable materials, truly biodegradable materials that are broken down by soil organisms and IRT (infra red transmitting) films. IRT materials are capable of transmitting infra red light (heat) for soil warming while at the same time blocking out photosynthetically active radiation (PAR) thereby inhibiting weed growth.

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PROCESSING TOMATO - FOLIAR FERTILIZATION TRIAL

G.E. Chevrier & L. Rankin

ABSTRACT: Nine different foliar fertilizer treatments were applied to a tomato crop (cv. Stokespak) planted for green chow processing. Low, medium and high rates of fertilizer were applied in one of three regimes: from transplant stage to fruit set; from fruit set to harvest; or all season. None of the fertilizer spray applications were phytotoxic at the rates tested. Only one foliar fertilizer treatment (full season application of 15-30-15/20-20-20/20-5-30 at a medium rate) outperformed the control treatment for yield of large green fruit.

TOMATES DE TRANSFORMATION - ESSAI DE TRAITEMENTS FERTILISANTS EN APPLICATION FOLIAIRE

Résumé: Neuf différents traitements fertilisants en application foliaire ont été faits sur une plantation de tomates (cultivar Stokespak) destinées à la fabrication de ketchup vert. Des taux d'engrais faible, moyen et élevé ont été appliqués à chacun des trois stades: de la transplantation à la formation de fruits, de la formation de fruits à la récolte, et durant toute la saison. Aucune des concentrations utilisées n'était phytotoxique. Un seul traitement fertilisant en application foliaire (application durant toute la saison de 15-30-15/20-20-20/20-5-30 à un taux moyen) a produit un meilleur rendement que le traitement de contrôle pour la production de gros fruits verts.

INTRODUCTION: Fertilizer application by foliar feeding is becoming an increasingly popular practice in vegetable production. Promotions for enriched soluble fertilizer specially formulated for rapid uptake and non-phytotoxic application are commonplace in grower/trade journals. Despite the many benefits that may be related to the use of such products, there appears to be some scepticism among researchers as to the actual advantage gained with scheduled foliar feeding if the soil nutrient status is adequate.

This evaluation was conducted to determine the effectiveness of foliar feeding on processing tomato grown in NB. Since the tomatoes grown for this purpose are harvested at the mature green stage, the use of foliar fertilisation with relatively high nitrogen and potassium content is of interest for increasing fruit size and harvest and possibly delaying fruit maturity.

MATERIALS AND METHODS: Three experimental sites were staked out in production fields on the farm of Stuart Bridges of Maugerville, NB. Each site had been previously transplanted to tomatoes (cv. Ultra Boy, Stokespak and Celebrity) for green chow processing.

A randomized complete block design with four replicates was used to randomize the ten foliar fertilization treatments (Table 1) that were evaluated in the trial.

The soil at the test site is classified as an interval soil (pH 6-6.2). Approximately 100 kg/ha of nitrogen was broadcast and incorporated prior to transplanting. Phosphorus and potassium rates were applied as directed

by laboratory analysis. Subsequent foliar fertilization was applied as outlined in Table 1. At harvest the weights of green and red fruits were recorded on a total plot (10 plants) basis. Green fruits were divided into two categories: large mature green with a diameter of greater than 2 inches (5 cm) as marketable, and small green fruits of less than 2 inches (5 cm) in diameter (non-marketable).

Of the three cultivars originally staked out for trial, only cv. Stokespak was harvested. Plant losses in cv. Celebrity, due to warm, dry conditions during transplant establishment, were too high to give valid comparison. Furthermore, intense heat just prior to the harvest period hastened pre-mature ripening and fruit decay of the plots containing cv. Ultra Boy.

TABLE 1: TOMATO FOLIAR FERTILIZATION TRIAL TREATMENTS

Treatments 1-3: Full Season (low, medium, high rates)

Beginning 3-4 weeks after transplanting, apply 15-30-15 at specified rate every 7 days until fruit has set. Follow with alternate, weekly applications of 20-20-20 and 20-5-30 at specified rate until picking.

1. 15-30-15 (6.5 kg/ha), 20-20-20 or 20-5-30 (5 kg/ha).
2. 15-30-15 (9.75 kg/ha), 20-20-20 or 20-5-30 (7.5 kg/ha).
3. 15-30-15 (13.0 kg/ha), 20-20-20 or 20-5-30 (10 kg/ha).

Treatments 4-6: Prior to Fruiting (low, medium, high).

Beginning 3-4 weeks after transplanting, apply 15-30-15 at specified rate every 7 days until fruit has set.

4. 15-30-15 6.5 kg/ha).
5. 15-30-15 (9.75 kg/ha).
6. 15-30-15 (13.0 kg/ha).

Treatments 7-9: Fruiting to Harvest (low, medium, high).

Beginning at fruit set, apply alternate, weekly treatments of 20-20-20 and 20-5-30 at specified rate until picking.

7. 20-20-20 or 20-5-30 (5 kg/ha).
8. 20-20-20 or 20-5-30 (7.5 kg/ha).
9. 20-20-20 or 20-5-30 (13.0 kg/ha).

10. Check - no foliar fertilizer applied.

Treatments based on Plant-Prod foliar fertilization schedule for tomatoes, peppers, cucumbers, melons and squash.

RESULTS AND DISCUSSION: During the trial, general observations for phytotoxicity were made at each week when foliar fertilizers were applied. No sign of plant damage was noted at any of the rates of application. Spraying was done prior to 1100 hours or after 1600 hours to avoid periods of high temperature when foliar treatments could lead to leaf burning.

Harvest data for large green fruits (Table 2) taken on September 8 indicate that yields were increased with the medium application rate of 15-30-15 (9.75 kg/ha) until fruit set/followed by alternate applications of 20-20-20/20-5-30 (7.5 kg/ha) until harvest (Treatment #2). This yield (12.87 kg/10 plants) was not, however, significantly different from the control treatment (11.17 kg/10 plants). The low and high application rates of 15-30-15 (6.5 and 13.0 kg/ha, Treatments #4 and 6) proved to be least beneficial as applications during the first part of the growing season (until fruit set) with large green fruit yields of 7.74 and 8.58 kg/10 plants respectively. The larger green fruit yields of all other treatments were within the range of 8.78 to 10.03 kg/10 plants.

TABLE 2: YIELD OF TOMATO CV. STOKESPAK GROWN UNDER VARIOUS FOLIAR FERTILIZATION REGIMES

Foliar Fertilization Treatment and Rate of Application	Yield Component (kg/10 plants) Lg.Green Fruit	Sm.Green Fruit	Red Fruit
1. Full season/low	8.78 b*	3.46 ab	2.44 a
2. Full season/medium	12.87 ab	4.79 a	1.20 a
3. Full season/high	9.72 ab	4.18 ab	1.54 a
4. Prior to fruiting/low	7.74 b	3.02 b	1.51 a
5. Prior to fruiting/medium	10.03 ab	3.97 ab	1.81 a
6. Prior to fruiting/high	8.58 b	3.55 ab	1.81 a
7. Fruiting to harvest/low	9.10 ab	4.05 ab	2.34 a
8. Fruiting to harvest/medium	9.77 ab	4.49 ab	1.98 a
9. Fruiting to harvest/high	9.25 ab	3.93 a	1.86 a
10. Control	11.17 ab	4.68 a	1.99 a

* Means separation by Duncan's Multiple Range Test (P=0.05).

Among treatments, only the low treatment application rate of 15-30-15 (Treatment #4, 6.5 kg/ha prior to fruit set) produced a significantly lower yield of small green fruits. All other treatment yields of small green fruit

were not significantly different. In addition, no significant differences were found among treatments for red fruit yields. The majority of foliar fertilization treatments yielded lower than the control treatment. The red fruit yield of control plants was 1.99 kg/10 plants, slightly above the mean for the range (1.20 to 2.44 kg/10 plants) of all treatments.

CONCLUSIONS: Under the conditions of this trial, foliar fertilizer applications did not prove to be beneficial over the control treatment. Given the added cost of materials and weekly spraying operations, the slight yield increase obtained by one of the treatments was not cost-efficient.

In general, the 1989 growing season was not ideal for green tomato production without irrigation. Very warm, dry periods during transplant establishment and fruit development had an adverse effect on yields. For example the 11.17 kg/10 plant large green fruit yield would be equivalent to 16.755 kg/ha, based on 15,000 plants/ha. Yields 30 to 40,000 kg/ha would be considered average. A repetition of this trial under better growing conditions might produce different results.

ACKNOWLEDGEMENTS: The authors thank Stuart Bridges for providing the test site for this trial.

Note on Processing Tomato Cultivars:

For a number of years the tomato cultivar Big Set has been the main cultivar grown for green tomato chow processing in NB. This cultivar is preferred because of its size and ease of picking. As well, it is relatively free of green shoulder. Unfortunately, seed of cv. Big Set will no longer be available after the 1989 season, therefore replacements of equal quality are needed.

During the 1989 growing season, 15 tomato cultivars were grown on the farm of Roger Hyatt, Cambridge Narrows, NB to screen for possible candidates. The test site is classified as a loam soil (pH 6.2-6.4). Prior to transplanting, 65 kg/ha of nitrogen was broadcast and incorporated. Phosphorus and potassium were applied as determined by soil analysis. The test site was irrigated as required. Soluble 20-20-20 fertilizer was added to the irrigation water periodically after the plants had set fruit. The cultivars were planted randomly at the test site. The trial was not replicated. Harvest data for each cultivar is contained in Table A. Each value represents the mean of 14 observations with the following exceptions: cv. Bragger, 12 observations; Sirene, 13 observations; Empire, 8 observations; and Celebrity, 4

observations.

Harvesting was done on September 4, around the Labour Day weekend, which is traditionally the time when the processor (McCready's, Sussex, NB) is set up for tomato chow production. During the 1989 season, there was a very warm spell at the beginning at the harvest season which hastened ripening in many cultivars (Table A). Despite early ripening, a number of cultivars showed potential for high yield of green fruit. For example, cvs. Mountain Pride, Floramerica and Ultra Girl produced yields of 4.41, 5.00 and 5.26 kg/ha respectively. Based on a one hectare planting of 8,000 plants (plants spaced at 1 x 1.2m) these yields would represent 35,000, 40,000 and 42,000 kg/ha, all of which are quite acceptable. The highest yielding cultivar was Champion of New Jersey (6.22 kg/of green fruit per plant) however, this cultivar has undesirable characteristics of irregular shape and deep ribbing which make preparation for processing difficult. Irregular shape was also noted for cvs. Oxhart and Bragger. Cultivar Big 7 has a moderate to high rate of catfacing.

TABLE A: WEIGHT OF MARKETABLE GREEN FRUIT (>5cm DIAMETER) AND NON-MARKETABLE FRUIT (SMALL GREEN OR RED) FROM FIFTEEN TESTED TOMATO CULTIVARS HARVESTED ON SEPTEMBER 4, 1989

CULTIVAR	WT(KG/PLANT) OF MARKETABLE FRUIT	WT(KG/PLANT) OF NON-MARKETABLE FRUIT	COMMENTS
Cavalier	1.28	1.41	Medium size, round fruits, regular smooth skin.
Heinz 1765	1.60	2.06	Small fruit size, slightly ribbed, round shape, few locules.
Harvest Vee	2.22	1.07	Medium fruit size, slightly ribbed fruit, few locules.
Mountain Pride	4.41	0.81	Medium to large fruit size, nice appearance, smooth regular skin, slightly ribbed.
Oxhart	4.02	1.20	Large fruit, irregular shape with very deep ribbing, many irregularities.
Floramerica	5.00	1.22	Medium to large fruit size, round & slightly ribbed fruit.
Early Red Rock	3.16	2.32	Small pointed fruit, smooth skin, hard, jointless fruit.
Giant Beefsteak	4.97	1.23	Large fruit, moderate ribbing, round shape.
Bragger	5.31	1.67	Large fruit, deeply ribbed, irregular shape.
Sirene	5.03	1.63	Medium to large fruit, medium to deep ribbing.
Big 7	5.77	1.81	Large fruit size, slight ribbing, catfacing noted.
Empire	4.63	0.95	Medium size, moderate ribbing, round fruits.

CULTIVAR	WT(KG/PLANT) OF MARKETABLE FRUIT	WT(KG/PLANT) OF NON-MARKETABLE FRUIT	COMMENTS
Celebrity	4.53	1.03	Medium to large size, moderate ribbing, round fruits.
Ultra Girl	5.26	1.10	Large size, moderate ribbing, slightly oval shape.
Champion of N.J.	6.22	1.56	Large size, very irregular shape, deep ribbing.

Cultivars Cavalier, Heinz 1765 and Early Red Rock produced small fruits which may not be ideal for the green processing market. Cv. Early Red Rock did although yield fairly well and was the only jointless cultivar (petiole is not attached to the fruit after picking) in the test. The jointless characteristic is very desirable in that it reduces the amount of handling and preparation prior to processing.

In conclusion, marketable yield and fruit characteristics should be taken into account in cultivar selection even if the product is destined for processing. Moderate ribbing, medium to large fruit size and the absence of catfacing are desirable traits. In this trial, these criteria were met by cvs. Mountain Pride, Floramerica, Giant Beefsteak, Sirene, Empire, Celebrity and Ultra Girl. Since this trial was not replicated and the number of plant observations for certain cultivars (Empire and Celebrity) were low, the cultivars should be seen as having potential and not as recommended for production.

ACKNOWLEDGEMENTS: The authors wish to thank Roger Hyatt for his cooperation during the course of the trial.

EASTERN CANADIAN DRY BEAN CO-OP TEST - NEW BRUNSWICK.

G.E.Chevrier & L.Rankin.

Abstract: Thirty-six dry bean cultivars were evaluated for their performance under N.B. growing conditions. Nine cultivars showed good potential: Navy bean cultivars; Seaforth, Rocket, Harokent and Dresden; Pinto bean cultivars RB84340, RB85232 and Topaz; Taylor Hort. Cranberry bean and NS-N-1 Narrow bean.

ESSAI COOPÉRATIF DE L'EST DU CANADA SUR LE HARICOT SEC - NOUVEAU-BRUNSWICK

Résumé : Nous avons évalué le rendement de trente-six cultivars de haricots secs, cultivés dans les conditions du Nouveau-Brunswick. Neuf cultivars semblent prometteurs : les cultivars de petits haricots blancs ; Seaforth, Rocket, Harokent et Dresden ; les cultivars de haricots Pinto RB84340, RB85232 et Topaz ; le haricot Taylor Hort Cranberry et le haricot Narrow NS-N-1.

Introduction: Dry bean (Phaseolus vulgarus) production in NB is a relatively small industry comprising 200-250 acres. Traditionally production has been based on the cultivation of coloured beans such as Jacob's Cattle, Soldier Bean and Yellow Eye Beans rather than Navy Bean (white bean) cultivars commonly grown in Central Canada. In addition to regional cultivar preferences, several cultural practices differ from region to region. For example, an inter row spacing of 28 to 36 inches is common in the Maritime provinces whereas Ontario production is carried out at closer spacings down to 7 inches between rows to suit the growth habit of recently developed white bean cultivars and maximize yields with modified harvesting machinery. Dry beans grown in the Maritime provinces are usually fertilized to a higher degree (especially with nitrogen) than those in Central Canada, often to help overcome the cool-wet soil conditions experienced in spring. Furthermore the bean yields obtained in the Maritime provinces are lower in comparison to Central Canada, possibly because of the fact that most of the available seed sources for traditional cultivars are infected with the bacterial blight organism Xanthomonas campestris pr. phaseoli.

A dry bean cultivar evaluation performed under NB growing conditions is of interest from the standpoint of finding new white and coloured bean cultivars readily adaptable to our region. The possibility of growing new cultivars which are less expensive to purchase and relatively free of the bacterial blight organism (because of efficient breeding programs) would greatly reduce the cost of production as well as reduce the field losses that are incurred with the use of traditional cultivars.

Materials and Methods: Thirty-six dry bean cultivars (Table 1) were obtained from Centralia College, Huron Park,Ontario. All cultivars were planted by hand on June 7,1989 on the Van Dine farm at Woodstock,NB. The soil at the test site is classified as a loam with a pH of about 6. Prior to planting, the soil was fertilized with 6-

6-24 at a rate of 350 kg/ha. Treflan(ppi) was used for weed control. Four single line replicates of each cultivar (5 m long) were planted in a Randomized Complete Block Design. One seed was planted every 4-5 cm along the row. The inter row spacing was 36 inches(91.44 cm). Flowering date, maturity and selected yield components were monitored. At harvest the middle 3 meters of each row were sampled.

Table 1- List of dry bean cultivar entries in 1989 evaluation.

Name	Type	Source
OAC Seaforth	Navy	Crop Sci.Dept.,U.Guelph
OAC Sprint	Navy	Crop Sci.Dept.,U.Guelph
OAC Cygnus	Navy	Crop Sci.Dept.,U.Guelph
OAC Gryphon	Navy	Crop Sci.Dept.,U.Guelph
Midland	Navy	W.G.Thompson & Sons Ltd.,Ontario
Rocket	Navy	W.G.Thompson & Sons Ltd.,Ontario
Wesland	Navy	W.G.Thompson & Sons Ltd.,Ontario
Stinger	Navy	W.G.Thompson & Sons Ltd.,Ontario
Mitchell	Navy	Agriculture Canada,Harrow,Ontario
Centralia	Navy	Agriculture Canada,Harrow,Ontario
Kentwood	Navy	Agriculture Canada,Harrow,Ontario
Harokent	Navy	Agriculture Canada,Harrow,Ontario
Dresden	Navy	Agriculture Canada,Harrow,Ontario
RB83043	Navy	Rogers Bros.,Boise,Idaho
RB83045	Navy	Rogers Bros.,Boise,Idaho
T-39	Black	University of California,Davis
Taylor Hort	Cranberry	Chatham Bean Co.,Ontario
Michigan Impr	Cranberry	Mich.State U.,East Lansing,Mn
ISB865	D.Red Kidney	Idaho Bean Co.,Twin Falls,Idaho
IG6604	D.Red Kidney	GenTec,Woodsley,Ontario
RB83353	D.Red Kidney	Rogers Bros.,Boise,Idaho
Soldier	Heirloom	New Brunswick
Jacob's Cattle	Heirloom	New Brunswick
Sacramento	L.Red Kidney	Sacramento Valley Milling,Cal.
Isabella	L.Red Kidney	Mich.State U.,East Lansing,Mn
NS-N-1	Marrow	Kentville,Nova Scotia
RB85312	Pink	Rogers Bros.,Boise,Idaho
Topaz	Pinto	Rogers Bros.,Boise,Idaho
RB84340	Pinto	Rogers Bros.,Boise,Idaho
RB85232	Pinto	Rogers Bros.,Boise,Idaho
Sierra	Pinto	Mich.State U.,East Lansing,Mn
Garnet	Small Red	Rogers Bros.,Boise,Idaho
Steuben	Yellow Eye	Agriculture Canada,Harrow,Ontario
Aresteuben	Yellow Eye	Agriculture Canada,Harrow,Ontario
Kenearly	Yellow Eye	Kentville,Nova Scotia
Maine Y.Eye	Yellow Eye	New Brunswick

Results and Discussion: Date of flowering (Table 2) ranged from 42 to 59 days after seeding. NB cultivars

Jacob's Cattle,Soldier and Maine Yellow Eye were among the first to flower at 42,45 and 47 days respectively. Cultivars T-39(58 days),Michigan Improved(57 days) and Sierra(59 days) were the latest to flower and yielded among the lowest of the cultivars evaluated (Table 5). No definite trend was observed relating early flowering to yield since many mid to late flowering cultivars (50-54 days) produced high yields.

Table 2- Comparison of flowering dates(50% of plants with at least 1 flower/averaged over 4 replicates)of dry bean cultivars. Numbers in brackets indicate days from June 7 planting.

Cultivar	Date of Flowering	Cultivar	Date of Flowering
Jacob's Cattle	July 19(42)	RB85232	July 27(50)
Sacramento	July 21(44)	R385312	July 28(51)
NS-N-1	July 21(44)	Topaz	July 28(51)
Soldier	July 22(45)	RB84340	July 28(51)
Isabella	July 23(46)	Midland	July 28(51)
Kenearly	July 24(47)	Stinger	July 28(51)
Maine Y.Eye	July 24(47)	Centralia	July 28(51)
ISB865	July 24(47)	IG6604	July 29(52)
Taylor Hort	July 26(49)	Garnet	July 30(53)
RB83353	July 26(49)	Aresteuben	July 30(53)
Mitchell	July 26(49)	Cygnus	July 30(53)
Seaforth	July 27(50)	RB83043	July 30(53)
Sprint	July 27(50)	Gryphan	July 31(54)
Rocket	July 27(50)	RB83045	July 31(54)
Wesland	July 27(50)	Steuben	July 31(54)
Kentwood	July 27(50)	Michigan Imp.	Aug. 4 (58)
Harokent	July 27(50)	T-39	Aug. 4 (58)
Dresden	July 27(50)	Sierra	Aug. 5 (59)

Because of early September frosts, maturity observations and harvest dates were modified. Instead of reporting maturity as the time taken for 95% of the pods to turn yellow, a rating of bean seed development (venation and extent of wrinkling after drying) and pod colour at the time of the killing frost was used. Although these methods are somewhat qualitative, some interesting comparisons can be made (Table 3). For example, all but one of the cultivars (Rocket) rated as mature based on bean grain development were also rated as more mature (group 1 & 2) using the pod colour method. All of the cultivars rated as early maturing were early or relatively early in time to flowering; Seaforth (50 days) NS-N-1 (44 days), Taylor Hort (49 days), Topaz (51 days) Isabella (46 days), Harokent (50 days), Sacramento (44 days), Jacob's Cattle (42 days). Furthermore, all of those rated as early maturing were among the top third highest yielding cultivars whereas the majority of cultivars rated in groups 3 & 4 were among the lowest third yielding (Table 5) cultivars.

TABLE 3. Maturity rating of individual Cultivars based on bean development (venation & wrinkling) and pod color at the time of frost, Sept. 12.

Maturity Rating based on Bean Development	Rating based on pod color
Maturity Group 1 (most mature)	**Maturity Group 1** (80% yellow, pods drying)
Seaforth	Taylor Hort.
NS-N-1	Topaz
	Seaforth
Maturity Group 2	
Taylor Hort.	**Maturity Group 2** (60-80% pods yellow)
Rocket	
Topaz	NS-N-1
Isabella	Isabella
Harrokent	Harokent
Sacremento	Mitchell
Jacobs Cattle	ISB865
	Soldier
Maturity Group 3	Sprint
Garnet	Sacramento
Kenearly	Jacob's Cattle
Michigan Impr.	
Gryphon	**Maturity Group 3** (30-50% pods yellow)
Cygnus	
Midland	Garnet
RB85312	Kenearly
RB84340	Maine Yellow Eye
Mitchell	Michigan Impr.
ISB865	Rocket
Soldier	Cygnus
	Midland
Maturity Group 4	RB84340
(late harvest in N.B.	Kentwood
ie last wk. Oct.)	Centralia
Maine Yellow Eye	Wesland
Dresden	
T-39	**Maturity Group 4** (full green to 20%
yellow)	
RB83043	Aresteuben
Sprint	Steuben
RB8522	Sierra
Kentwood	RB83043
Wesland	Dresden
IG6604	T-39
RB83353	RB83045
Steuben	Gryphon
Aresteuben	RB85312
Stinger	Stinger
Sierra	IB6604
Centrailia	RB83353
RB83043	

Table 4 outlines two yield parameters; bean number per 20 pods and seed weight (g/100 seeds). As expected, the navy and pinto types had larger number counts whereas kidney, cranberry and yellow eye types had higher 100 seed weights.

Cultivar	Count per 20 pods	Cultivar	g/100 Seeds
T-39	113.00a	Sacremento	57.78a
RB3043	108.25ab	ISB865	56.83ab
Gryphon	106.00ab	Taylor Hort.	55.25ab
RB83045	102.50a-c	RB83353	54.83ab
Centralia	97.16 b-d	Jacob's Cattle	54.55ab
Stinger	96.50 b-d	LG6604	53.55 bc
RB84340	93.75 b-e	Soldier	53.10 bc
Dresden	93.56 b-e	Aresteuben	50.70 cd
RB85312	89.25 c-f	Isabella	50.67 cd
Taylor Hort	89.00 c-g	Maine Y. Eye	48.08 cd
Seaforth	88.75 c-h	Kenearly	47.92 d
Mitchell	88.75 c-h	Michigan Imp.	47.00 d
Midland	87.75 c-h	NS-N-1	38.74 e
Gygnus	87.00 c-h	RB84 340	35.05 f
Wesland	87.00 c-h	Topaz	32.47 fg
Sierra	85.50 d-h	RB85232	32.06 fg
RB85232	82.38 d-i	RB85312	31.00 g
Garnet	82.25 d-j	Sierra	29.50 gh
Kenearly	80.75 e-k	Garnet	26.35 h
Kentwood	78.25 f-l	Kentwood	21.40 i
Rocket	76.50 f-l	Harokent	21.02 i
RB83353	76.00 f-l	Spirit	20.95 ij
Jacob's Cattle	76.00 f-l	Rocket	19.38 i-k
Soldier	75.75 f-l	Seaforth	18.83 i-l
Harokent	75.75 f-l	Stinger	18.63 i-l
IG6604	75.25 f-l	Mitchell	18.52 i-l
Topaz	75.00 f-l	Cygnus	18.20 i-m
Isabella	72.00 g-l	Gryphon	18.20 i-m
NS-N-1	71.75 h-l	Centralia	17.04 j-n
Sacramento	66.25 i-l	Dresden	16.65 k-n
ISBH865	65.00 j-l	T-39	16.50 k-n
Marie Y. Eye	64.75 j-l	Midland	15.00 l-n
Aresteuben	63.00 k-l	RB83045	14.38 mn
Michigan Impr.	61.75 k-l	RB83043	13.75 n
Sprint	59.50 l	Wesland	10.00 o
L.S.D. (0.05) = 14.11		L.S.D. (0.05) = 3.37	

Significant differences were found among cultivars when weights of saleable beans and culls were compared (Table 5). Cultivars with the highest yields (Sacramento,RB84340,Taylor Hort,NS-N-1,Jacob's

Cattle,Topaz and Seaforth) had relatively low percentage cull (pick) rates. These cultivars were early to moderately early flowering and rated in maturity groups 1 or 2. Cultivars IG6604,Aresteuben and Michigan Improved had the lowest saleable bean yields and the highest percent culls of all cultivars evaluated (54.4,72.0 and 94.4% respectively). Culls of all three cultivars included off coloured and wrinkled beans. These cultivars were rated late flowering and maturing during the growing season.

TABLE 5. Comparison of saleable grade & cull weights of dry beans. Values represent the harvest area of 3m of row in 4 replicates.

Cultivar	Weight(g) of Saleable grade	Weight (g) of culls	Culls expressed as a % of total Weight
Sacramento	558.47a	48.05jk	7.9
RB84340	537.13ab	142.43c-j	21.0
Taylor Hort.	536.33ab	43.25jk	7.5
NS-N-1	532.28ab	30.95k	5.6
Jacob's Cattle	527.90a-c	64.35h-k	10.9
Topaz	526.88a-c	80.05g-j	13.2
Seaforth	577.92a-c	35.17k	6.4
Dresden	501.42a-d	81.50g-j	14.0
Midland	495.82a-d	31.44k	6.0
Harokent	494.50a-d	41.70jk	7.8
Kentwood	479.40a-e	70.75h-k	12.9
Isabella	473.27a-f	68.93h-k	12.7
Sprint	455.70a-f	60.08i-k	11.6
Mitchell	452.00a-g	45.50j-k	9.1
Centralia	429.38a-g	61.50i-k	12.5
Garnet	421.92b-h	142.20c-e	25.2
Soldier	412.88b-i	104.90e-h	20.3
RB85312	411.10c-i	215.82b	34.4
RB83043	398.35d-i	135.48c-f	25.4
ISB865	379.23e-i	154.93cd	29.0
RB83045	376.33f-i	115.25d-g	23.4
Gryphon	365.88f-k	151.90cd	29.3
Rocket	356.77g-k	69.53h-k	16.3
Gygnus	343.88g-k	64.45h-k	15.8
Stinger	343.63g-k	140.35c-f	29.0
Wesland	322.85h-k	38.97jk	10.8
RB85232	317.75h-k	138.70c-f	30.4
T-39	307.50i-l	127.05c-f	29.2
RB83353	276.55j-l	239.48b	46.4
Maine Y.Eye	263.55j-l	98.82f-i	27.3
Kenearly	260.83kl	123.18c-f	32.1
IG6604	206.10 l	245.43b	54.4
Aresteuben	63.05 m	161.45c	72.0
Michigan Imp.	19.13 m	321.50a	94.4

Means separation by Duncan's multiple Range Test (0.05)

Table 6 outlines quality aspects (after culling) of

the cultivars tested. Among the Navy bean types, some variation was noted as far as white colour intensity was concerned. According to the grading system used for this trial, a bean with a 3/3 or 3/4 rating (uniformity/appearance) would be of high quality. However, since these ratings were done after culling, a cultivar like Aresteuben (3/4) received a good rating but had one of the lowest yields and a 72% cull rate. Thus all other factors should be taken into account before attempts are made to select suitable cultivars.

Conclusions.

This trial indicates that there are a number of cultivars with potential for production in NB. These cultivars should be relatively early flowering and maturing, they should yield reasonably well and have a low cull rate. The following cultivars fit these criteria: Seaforth (Navy), Rocket (Navy), Harokent (Navy), Dresden (Navy), Taylor Hort. (Cranberry), NS-N-1 (Marrow), Topaz (Pinto), RB84340 (Pinto) and RB85232 (Pinto).

It should be noted that these observations are based on only one year of evaluation. High yielding cultivars which had low quality ratings in 1989 should be re-tested in future trials.

Note: the authors wish to acknowledge the support support provided by project coordinator, Bob Forres, Centralia College, Ontario.

TABLE 6. **Bean Quality Rating (After Culling)**

Variety	Size	Colour	Uniformity of Size	Appearance
Seaforth	sm-med	u.white	3	3
Sprint	med	u.white	2	3
Cygnus	med	u.white	3	3
Gryphon	sm-med	grey/wh.	2	1
Midland	sm	u.white	1	3
Rocket	med	u.white	3	3
Wesland	med	dull wh.	2	2
Stinger	med	grey/wh.	2	2
Mitchell	med	dull wh.	1	3
Centralia	med	dull wh.	2	3
Kentwood	med	u.white	2	3
Harokent	med	dull wh.	3	3
Dresden	sm-med	u.white	3	3
RB83043	sm-med	grey/wh.	1	1
RB83045	med	dull wh.	2	2
T-39	med	black	3	4
Taylor Hort.	lg.	mar.on o.wh.	3	3
Mich. Imp.	lg.	mar.on o.wh.	3	3
ISB865	lg.	mod.u.red	3	2
IG6604	lg.	u.red	2	3
RB83353	med-lg.	u.red	3	4
Soldier	lg.	mod.u.	3	3
Jacob's C.	med-lg	u.	3	4
Sacremento	lg.	non u. pink	2	2
Isabella	med-lg	non u. pink	3	2
NS-N-1	lg	u.b.white	3	4
RB85312	med-lg	u.dk.pink	2	4
Topaz	lg.	u.br. mot	3	4
RB84340	med-lg	non u.br.	3	2
RB85232	med-lg	u.br. mot	3	3
Sierra	med-lg	var.br.mot	2	2
Garnet	sm-med	mod.u.red	3	3
Steuben				
Aresteuben	lg.	u.white	3	4
Kenearly	lg.	u.white	3	4
Maine Y.E	lg.	u.white	3	4

Appearance and Uniformity of Size Rating System

1 - non uniform size or poor appearance
2 - moderately uniform size or moderately poor appearance
3 - uniform size and attractive appearance
4 - exceptionally uniform size and very attractive appearance

FIELD ESTABLISHMENT OF FIDDLEHEADS

B. Dykeman and J. McCully

ABSTRACT: A study was established in 1985 to evaluate the effect of planting depth and mulching on early rhizome production and new crown development in the field. In 1989 results indicated that immediate mulching did have a positive impact on these parameters, but that no significant differences resulted from different planting depths.

CULTURES DES CROSSES DE FOUGÈRE DANS LES CHAMPS

RÉSUMÉ : Une étude a été entreprise en 1985 pour évaluer les effets de la profondeur de plantation et du paillage sur la production hâtive de rhizomes et sur le développement des nouvelles pousses dans les champs. En 1989, les résultats indiquaient que le paillage immédiat avait eu un impact positif sur ces paramètres, mais qu'il n'y a pas eu de différences significatives suite aux diverses profondeurs de plantation.

INTRODUCTION: A goal in establishing any perennial crop is to bring it into full production in as short a period of time as possible. In fiddleheads, this means; 1) increasing the plant population from the 10,000 plant planting-rate to 300,000 plants per hectare and, 2) attaining full crozier size potential. Rapid plant reproduction the field is dependent on the rate of rhizome production and on the vigour and longevity of the mother crowns.

MATERIALS AND METHODS: The study, established on a riverbank sandy loam utilized 1 1/2 year old dormant plants of clone NB44 in a 2 factor RCBD. Plots were 2 m * 6 m with 12 plants per plot with four replications.

The treatment were as follows:

Planting Depths:

1. planted with crown at previous soil level.
2. planted with crown just covered with soil.
3. planted in a 15 cm trench with crowns at the bottom of the trench

Mulching:

1. no mulch
2. 5 cm mulch the first fall, and 2 cm applied each fall thereafter
3. 5 cm mulch applied once at planting time

Fertilizer (15-15-15) was incorporated at a rate of 600 kg/ha in the spring before planting. 15-15-15 at the

rate of 1000 kg/ha was applied annually.

RESULTS AND DISCUSSIONS: Although an LSD-test will not confirm this, the application of one mulch immediately after planting did appear to be the superior establishment treatment (Table 1). There was no significance, however with respect to different planting depths on field establishment.

TABLE 1. Effects of mulching and planting depth on fiddlehead yield components.

Treatment	Plot Yield (g)	Projected Yield (kg/ha)	Plant Density (pl/m2)	Crozier Weight (g)
mulch				
no mulch	1024.5	1707	36.4	0.7
annual	1127.1	1878	32.7	0.9
once, at planting	1467.5	2445	44.2	0.8
depth of planting				
original depth	1152.3	1920	39.6	0.8
top of crown	1166.5	1944	34.7	0.8
15 cm trench	1300.3	2167	39.0	0.8
LSD(p=0.05)	534.6	891	13.1	0.2

CONCLUSIONS: It appears that there is no advantage to annual mulching to encourage faster field establishment. One mulch applied at planting time was adequate to promote early rhizome development. Deeper planting of the crowns also did not promote more rhizome growth.

OSTRICH FERN CLONAL SELECTION PROGRAM

B. Dykeman and J. McCully

ABSTRACT: Selection of superior clones of the ostrich fern is continuing. This year's data demonstrates a wide variation among clones in all performance parameters. Yields have increased steadily over the past three years. Dramatic clonal differences have emerged from a newly conducted fiddlehead blight evaluation and a crozier flavour and quality evaluation.

PROGRAMME DE SÉLECTION CLONALE DE FOUGÈRES À L'AUTRUCHE

RÉSUMÉ : La sélection de clones supérieurs de fougères à l'autruche se poursuit. Les données de cette année montrent une grande variation parmi les clones dans tous les paramètres de performance. Les rendements ont augmenté de façon uniforme au cours des trois dernières années. Des différences clonales importantes ont été remarquées dans le cadre d'une nouvelle évaluation du dépérissement des crosses de fougère et de l'évaluation de la saveur et la qualité des crosses.

INTRODUCTION: From work carried out from 1976-1983, (Dykeman, 1985a) it was clear that the selection of superior clones of the Ostrich fern was possible and that large advances in productivity should be realized by such selection. It was found that broad genetic variability existed for such traits as: the rate of rhizome production, the number of croziers produced and released per year, the size of crozier; as well as, the time of emergence. Therefore, it was decided to continue a program of clonal selection and to expand the selection base.

METHODS AND MATERIALS: In 1984, a collection of 1,000 clones were established at the N.B.H.C. on a riverbank sandy loam soil. These clones had been randomly collected as single crowns from throughout N.B. The crowns were planted in single plant plots 2m apart in and between rows. Plants were mulched with 5 cm of sawdust and fertilized with 15-15-15 at 600 kg/ha per year. Final selection of 30 clones was made from this material in 1988. These clones were advanced to a new replicated clone trial, planted in the fall of 1988.

Also in 1984, sixteen (16) clones which were selected from an earlier collection of 54 clones were established in a randomized block design with three replications and 12 plants per plot. Plants spaced 0.5 * 2.0 m. Plots were mulched and fertilized as above. Data collection was initiated in 1985. In addition to yield data, in 1989 fiddleheads were evaluated for flavour and eating quality and the clones were evaluated for susceptibility to fiddlehead blight.

The evaluation of head quality in 1989 was very preliminary, but indicated a wide variation in quality

and flavour between clones, in texture and in the ability to retain the tight fiddlehead shape after cooking.

RESULTS AND DISCUSSIONS: According to LSD values there was tremendous variation among clones in all performance parameters. From a blight analysis of the clones, it was shown that clone NB06 was very susceptible to fiddlehead blight. With respect to 1989 data, projected yields have increased steadily over the past few years for all clones (Table 2.)

Table 1. Performance of selected clones of the ostrich fern after 5 growing seasons 1989.

Clone	Plot Yield (g)	Projected yield (kg/ha)	Crozier weight (g)	Plant density (pl/m2)	Blight intensity (scale of 1-5)
NB 12	2049.9	3416	1.0	52.5	1
NB 53	1842.1	3070	1.4	52.0	1
NB 39	1806.6	3011	1.2	54.6	1
NB 04	2448.6	4081	1.2	63.6	2
NB 19	1955.5	3259	1.4	44.0	1
NB 33	1661.5	2769	1.1	45.5	2
NB 44	2050.2	3417	1.1	54.6	1
NB 13	1145.1	1908	1.5	30.8	1
NB 42	2003.4	3339	1.1	53.8	1
NB 41	1634.2	2723	1.1	48.6	1
NB 06	1625.3	2708	1.5	32.3	5
NB 05	2227.7	3712	1.1	45.6	1
NB 21	1645.2	2742	1.1	45.6	1
NB 08	1429.6	2382	1.2	29.0	1
NB 14	1981.3	3302	1.1	51.5	1
NB 18	1630.9	2718	1.1	62.0	1

TABLE 2. Projected yearly and total yields over the last 3 years.

Clone	Projected yields - kg/ha 1987	1988	1989	Total Yield (kg/ha)
NB 12	838	765	3416	5019
NB 53	472	1288	3070	4830
NB 39	350	765	3011	4126
NB 04	889	832	4081	5802
NB 19	834	2383	3259	6476
NB 33	378	1456	3417	5252
NB 44	762	801	1908	3471
NB 13	310	1932	2769	5011
NB 42	586	735	3339	4660
NB 41	454	926	2723	4103
NB 06	700	1540	2708	4949
NB 05	928	508	3712	5149
NB 21	659	1143	2742	4545
NB 08	739	685	2382	3807
NB 14	449	1360	3302	5112
NB 18	392	1187	2718	4298

TABLE 3. Fiddlehead quality analysis of the different clones

Clone	Flavour	Texture	Ability to Hold Shape	Moisture Content
NB 12	good	good	very well	...
NB 53	bitter	tough;stringy	...	...
NB 39	bitter	poor	...	...
NB 04	good	good	very well	...
NB 19	strong flavour	...	...	low
NB 33	bad	...	very poor	...
NB 44	a bit bitter	good	...	very high
NB 13	strong flavour	good	good	...
NB 42	flat;bland	very good	...	...
NB 41	good	good	...	ideal
NB 06	very bitter	...	...	...
NB 05	bland	good	...	high
NB 21	very good	good	...	ideal
NB 08	a bit bitter	good	...	...
NB 14	bitter	good	...	very low
NB 18	good	very poor	...	very low

POPULATION DYNAMICS IN MATURE FIDDLEHEAD STANDS

B. Dykeman and J. McCully

ABSTRACT: A trial was initiated in 1985 to study the plant population shifts in a mature stand, and to evaluate the effects of annual mulching and harvesting on the population and plant vigor. Data for 1989 suggests that harvesting over the past three years may be having a negative impact on crozier size and plot yields. While yields have declined, plant population has increased under the management practices applied (fertilization, harvesting). There were no significant differences between mulched and unmulched plots.

DYNAMIQUES DES PEUPLEMENTS DE CROSSES DE FOUGÈRE PARVENUS À MATURITÉ

RÉSUMÉ : Une étude a été lancée en 1985 pour connaître la variation des dynamiques des peuplements de crosses de fougère parvenus à maturité et pour évaluer les effets annuels du paillage et de la récolte sur la vigueur des plants. Les données pour 1989 suggèrent que les récoltes effectuées au cours des trois dernières années ont peut-être eu un effet négatif sur la grosseur de la crosse et sur les rendements des peuplements. Il est vrai que les rendements ont diminué, mais la population des plants a augmenté, et ce, grâce aux pratiques de gestion (fertilisation et récolte). Il n'y a pas eu de différence significative entre les parcelles paillées et non paillées.

INTRODUCTION: Little is known of the population dynamics of mature stands of fiddlheads - length of crown life, rate of new crown development and the effect of harvesting on these two variables. Also unknown is the long-term effect of mulching on plant population and vigor. A trial was initiated in 1985 to study this situation, using a plantation established in 1969 by R. White (CDA). The crowns were transplanted from the wild and allowed to growth without interference for 18 years.

In 1985, the first management input were applied - fertilizer and herbicides. In 1986, the first harvest was taken.

MATERIALS AND METHODS: Plots 2 m * 1 m and subdivided into mulched and unmulched plots of 1 m * 1 m were staked out in an established stand at M.P. Harrison's, Maugerville. Fertilzier (15-15-15) at a rate of 600 kg/ha is applied annually in the spring. Aged sawdust is applied in the fall after frost to a depth of 2 cm on the mulched plots.

The herbicides, Roundup (500 mL/5 L) and Simazine (255 g/5L) (1 kg active/ha) are applied in the spring pre-emergence to control weeds.

RESULTS AND DISCUSSIONS: Plant densities are increasing, while crozier size and possibly plot yields are declining under the management practices applied. The trend in overall plot yields is not clear and may stabiize around 5000-6000 kg/ha. There was no significant difference, however between mulched and unmulched treatments.

TABLE 1. Growth and yield performance of a mature ostrich fern stand.

TREATMENT	Crozier Weight (g)	Plot Yield (g)	Plant Density (pl/m2)	Projected Yield (kg/ha)
No Mulch	1.5	569	71.5	5691
mulched	1.6	564	67.8	5650
LSD(p-005)	0.3	174	17.5	1748

TABLE 2. Response to mulch treatment over the past four years

YEAR	Crozier Weight (g)	Plot Yield (g)	Plant Density (pl/m2)	Projected Yield (kg/ha)
1986	3.5	637.1	40.8	6371
1987	3.8	1190.6	52.0	11906
1988	2.7	623.8	55.0	6238
1989	1.6	565.0	67.8	5650

EFFECT OF SAWDUST MULCH ON THE EMERGENCE OF DIRECT SEEDED VEGETABLES

K.T.V. Michalica

ABSTRACT: Sawdust mulch prevented crop failure of direct seeded carrots and beets grown on Holmesville soil series. The emergence of parsnips, cabbage and carrots grown on the Interval soil series was increased by 45.8, 11.3 and 2.6% respectively.

EFFETS DU PAILLIS DE SCIURE SUR L'ÉMERGENCE DES LÉGUMES CULTIVÉS À SOL OUVERT

K.T.V. Michalica

RÉSUMÉ: Le paillis de sciure a permis d'éviter une récolte déficitaire de carottes et de betteraves cultivées à ciel ouvert sur la série de sol Holmesville. L'émergence des panais, des choux et des carottes cutivés sur la série de sol Interval a augmenté de 45,8 %, 11,3 % et 2,6 % respectivement.

INTRODUCTION: The positive effects of sawdust mulch as an anti-crustant for direct-seeded vegetable production has been demonstrated over the past several years. The effectiveness however, varied due to weather patterns following seeding as well as varied soil characteristics. The reason to continue sawdust mulch testing through 1989 was twofold:

1. to promote the technology among producers.
2. to continue testing the effectiveness of the mulch under various soils and weather patterns.

MATERIALS AND METHODS: Sawdust was placed over the rows of direct-seeded carrots, parsnips and cabbage immediately after seeding. A band 10 cm wide and 0.5 cm thick (10-15m^3 per hectare) was placed by an "Egedal" spreader and manually.

The testing was conducted at three sites:

1. McGowan's Corner, Interval silt loam soil series.
2. Jemseg, Interval silt loam soil series.
3. Drummond, Holmesville fine sandy loam soil series.

RESULTS AND DISCUSSION:

1. The effectiveness of sawdust mulch at the site in Drummond was dramatic. The crop of carrots and beets unprotected by the mulch was a total failure. The vast majority of seed did not emerge and the crop had to be re-seeded. The crop under protection of sawdust, on the other hand, has produced a marketable crop.

2. The emergence of cabbage grown in Jemseg was on average increased by 11.3% by the application of sawdust mulch. The emergence data are presented in Table 1.

TABLE 1: EFFECT OF SAWDUST ON EMERGENCE OF CABBAGE (JEMSEG)

Emergence per 20m row		Deviation from
mulched	control	control (%)
160	139	+ 15.1
182	140	+ 30.0
127	126	+ 0.7
105	105	0.0
Av: 143.5	127.5	+ 11.3

3. The emergence of carrots grown on the McGowan's Corner site was increased by sawdust mulch on average by 2.6%. The emergence of parsnips at the same site was increased by sawdust mulch by 45.8%. The emergence data are presented in Table 2.

TABLE 2: EFFECT OF SAWDUST ON EMERGENCE OF CARROTS AND PARSNIPS (McGOWAN'S CORNER)

Crop	Emergence per 5m row		Deviation from
	mulched	control	control (%)
carrots	188	258	- 27.1
	180	140	+ 28.6
	189	145	+ 30.3
Average	185.7	181.0	+ 2.6
parsnips	51	51	0.0
	83	39	+112.8
	73	52	+ 45.8
Average	69.0	47.3	+ 45.8

The weather and soil conditions affected seedling emergence. At McGowan's Corner, seeding was followed by cool and moist weather that did not induce the formation of soil crust. The weather following seeding at the Jemseg site was warm and dry and also did not induce formation of the soil crust. A hot, dry spell that followed seeding in Drummond did not induce crust formation but scorched and dried up emerging seedlings.

RECOMMENDATIONS: Several commercial fields using alternative sawdust mulch and control should be established on Interval and Holmesville soil series. Sequential seeding, several days and weeks apart should be used to cover weather differences. The efficiency of the mulch under various weather patterns, soil characteristics, as well as the economy of the mulch treatment, should be evaluated.

ACKNOWLEDGEMENTS: The cooperation and assistance of producers Greg Banks, Collette Bard and Reginald Slocum is greatly appreciated.

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OAT CULTIVAR EVALUATION 1989

D.F. Walker and A.O.M Smith

ABSTRACT: Ten normal and 3 hull-less lines and cultivars of oats were seeded May 23, 1989 in a R.C.B. design with 4 replications. Seeding rate was 350 viable kernels/m^2. Plots were harvested Aug. 30, 1989 with a 125 B combine. Capital, the newly recommended cultivar, had the highest yield at 4.9 T/ha followed by: Marion, Q0237.3, Q0220.4, at 4.7 T/ha, and Nova at 4.6 T/ha. The remaining normal oats Shaw, Manic, Q0220,0, Q0224,5 and OA791.4 had yields ranging from 4.4 to 4.0 T/ha. The 3 hull-less lines OA726.12, OA753-2 and Tibor had yields of 3.4, 3.4 and 2.8 T/ha respectively.

ÉVALUATION DE CULTIVARS D'AVOINE - 1989

Résumé: Dix cultivars d'avoine ordinaire et trois variétés d'avoine à grains nus ont été semés le 23 mai 1989 dans un dispositif expérimental en bloc divisé au hasard et répété quatre fois. Le taux d'ensemencement était de 350 grains viables par mètre carré. Les parcelles ont été moissonnées le 30 août 1989 avec une moissonneuse-batteuse Hedge 125B. Le cultivar Capital, dernièrement recommandé, a donné le meilleur rendement, soit 4,9 t/ha; le rendement des cultivars Marion, Q0237,3 et Q0220,4 était de 4,7 t/ha, et celui du Nova était de 4,6 t/ha. Les autres cultivars d'avoine ordinaire (Shaw, Manic, Q0220,0, Q0224,5 et OA791,4) ont donné un rendement variant de 4,4 à 4 t/ha. Le rendement des trois variétés d'avoine à grains nus, OA726,12, 03669 et Tibor, était de 3,4, 3,4 et 2,8 t/ha respectivement.

INTRODUCTION: There continues to be interest in oats as human food, mainly because of the beneficial effects of oats in preventing or reducing diseases. Increased oat consumption resulted in high prices relative to other grains in the 1986-1988 period, but with rapidly increasing supplies oat prices have once again returned to their historical levels in relation to other grains. New Brunswick's oat production is used primarily for livestock feed and consequently high prices were the result of shortages and not due to improved quality. Interest in hull-less oats remains high with livestock producers because of the high protein (lysine) and energy values. Hull-less oats are superior in feeding value to any other grain produced in N.B. The major limiting factor to hull-less oat production is its low yield.

MATERIALS AND METHODS: An oat cultivar study consisting of 13 cultivars was seeded May 23, 1989 at Hartland N.B. A Wintersteiger plot seeder with a 12 cm row spacing was used to seed 350 viable kernels/m^2. The plot size was 2 m x 8.5 m in an R.C.B. design with 4 replications. Fertility consisted of 200 kg/ha 17-17-17 broadcast and incorporated at seeding. An additional 250 kg/ha 34-0-0 was broadcast on June 19, 1989. A tank mixture of Tilt (125 g ai/ha), Cycocel (200 g ai/ha) and Blagal (840 g ai/ha) was applied with a small plot sprayer at G.S. 13-14 (June 13, 1989). On Aug. 30, 1989 a Hege 125 B combine was used to harvest all plots.

RESULTS AND DISCUSSION: The oat trial was seeded 10-15 days later than normal but the expected yield depression did not occur when compared to results from 1986-1988. (Duivenvoorden et. at. 1986, Duivenvoorden et.al.1987,

Walker and Smith, 1988). Capital, Marion and Nova, 3 recommended cultivars, continue to produce high yields at 4.9, 4.7 and 4.6 T/ha respectively (Table 1). Capital, the newest recommended cultivar, will replace the old cultivars Sentinal and Shaw as seed supplies become available. The numbered lines QO237.3 (4.7 T/ha), QO220.1 (4.7 T/ha), QO220.9 (4.4 T/ha) and QO224.5 (4.3 T/ha) had lower yields than Capital (4.9 T/ha).

Thousand kernel weight was high ranging from a high of 42.2 g for Marion to a low of 33.0 g for the hull-less line OA 753-2. T.K.W.'s of all cultivars were very high relative to 1986, 1987 and 1988 indicating excellent fertility and moisture, low disease levels, and the absence of lodging (Table 1).

The dry growing conditions prior to heading and the Cycocel (200 g ai/ha) application at G.S. 30 resulted in short straw, and no lodging.

Two lines, QO237.3 and QO220.1 show some potential and a decision on their registration will be made at the Eastern Expert Committee Meetings. The remaining lines QO220.9, QO224.5 and OA791-4 show little potential and it is doubtful if the breeders of these lines will pursue registration. The 2 hull-less lines OA726-12 and OA 753-2 (3.4 T/ha) both outyielded Tibor and should be registered in 1990.

TABLE 1: YIELD AND T.K.W. AND LODGING OF OAT CULTIVARS - HARTLAND, 1989

Cultivar	Yield (T/ha)	TKW (g)	*Lodging
Capital	4.9 a	35.4	0
Marion	4.7 ab	42.2	0
QO237.3	4.7 ab	38.9	0
QO220.1	4.7 ab	37.5	0
Nova	4.6 ab	36.7	0
Shaw	4.4 ab	36.6	0
Manic	4.4 ab	39.7	0
QO220.9	4.4 ab	40.6	0
QO224.5	4.3 ab	39.0	0
OA791-4	4.0 bc	35.0	0
OA726-12	3.4 cd	35.1	0
OA753-2	3.4 cd	33.0	0
Tibor	2.8 d	33.8	0
LSD (.05)	.79	1.88	
C.V. %	13.07	3.53	

* Harvest lodging - Belgium lodging scale

CONCLUSIONS: The recommended cultivars Capital, Marion and Nova continue to be the superior cultivars available. Two other lines QO237.3 and QO220.1 show some potential but further testing is required to prove the value of these cultivars. The 2 hull-less lines OA726.72 and OA753-2 have superior yield compared to Tibor. Our studies indicate these 2 cultivars should be registered and made available to farmers.

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YIELD AND AGRONOMIC CHARACTERISTICS OF ORGANIC GRAIN PRODUCTION 1989

D.F. Walker and A.O.M. Smith

ABSTRACT: Eleven wheat, 3 oat, and 1 barley cultivar were planted in a R.C.B. design with 4 reps at Centreville, N.B. on May 18, 1989. Yields of the three species ranged from 2.7 to 1.7 T/ha, 2.6 to 2.1 T/ha, and 2.4 T/ha for wheat, oats, and barley respectively. Lodging only occurred on 4 cultivars at very low levels. Thousand kernel weight's were low ranging from 32.9 to 22.0 g.

RENDEMENT ET CARACTÉRISTIQUES AGRONOMIQUES DE LA CULTURE DE CÉRÉALES ORGANIQUES - 1989

Résumé: Onze cultivars de blé, trois d'avoine et un d'orge ont été plantés le 18 mai 1989 à Centreville (N.-B.) dans un dispositif expérimental divisé au hasard et répété quatre fois. Le rendement des cultivars de blé variait de 2,7 à 1,7 t/ha, celui des cultivars d'avoine, de 2,6 à 2,1 t/ha, et celui du cultivar d'orge était de 2,4 t/ha. Seulement 4 cultivars ont été couchés par la verse à des degrés très faibles. Le poids de mille grains était bas et variait de 32,9 g à 22 g.

INTRODUCTION: Interest in organic agriculture (chemical free, low input) is expanding as a result of increased awareness and concern about chemicals in the food supply. Producer and consumer groups have been formed to promote chemical free food production. These methods of production do not allow the use of synthetic fertilizers, herbicides, insecticides, or fungicides. They rely mainly on crop rotation, natural soil mineralization, the application of manures, and natural fertility sources for plant nutrition. Damage from diseases and insects pests is achieved mainly through genetic resistance and the avoidance of monoculture crop production. Yields from organic production systems are usually lower than the more conventional systems, however, cost of production is usually lower and consumers are prepared to pay more for certified organically grown crops. Cosmetic appeal of organically produced crops is usually less than conventionally produced crops, but consumers will overlook some disease and insect damage if they know that the crops were organically grown. The purpose of this project was to determine the production potential of new and old wheat, oat and barley cultivars when grown under an organic protocol.

MATERIALS AND METHODS: Eleven wheat, 3 oat and 1 barley cultivar were seeded at Centreville, N.B. in an R.C.B. design with 4 replications on May 18, 1989. A Wintersteiger plot seeder with 12 cm row spacing was used to seed the 2 m x 8.5 m plots. All plots were underseeded with red clover at G.S. 13. Manure was applied and incorporated at a rate of before seeding. A chain harrow was used to eliminate some weeds at G.S. 13-14. All plots were harvested on Aug. 25, 1989 with a small plot combine.

The plots were grown using an organic production protocol established by the Organic Crop Improvement Association (O.C.I.A). The O.C.I.A. production recommendations specify that no synthetic fertilizers, herbicides, fungicides, insecticides or seed treatments be used.

RESULTS AND DISCUSSION: Yields ranged from 2.7 to 1.7 T/ha for Max and Kyle (Table 1). Max, a German milling wheat, gave significantly higher yields than all other wheats. Its higher yields are likely due to its high harvest index, genetic disease resistance and adaptability to maritime climates compared to other wheats. Five wheat cultivars, all of Western Canadian origin: Katepwa, Roblin, Columbus, Laura, and Neepawa had yields ranging from 2.3 to 1.9 T/ha. The remaining 5 wheats were from diverse origins and had yields of 1.8 to 1.7 T/ha (Table 1). Yield comparisons of organic production and conventional production are difficult because of the regulations governing crop rotation and chemical use on certified organic farms. This requirement invalidates any comparison because conventional and organic plots cannot be grown side-by-side in the same field. Relative comparisons can be made realizing the limitations that distance places on the validity of the comparison. For a crude comparison to 4 levels of management with Max and Katepwa, see Walker and Smith (1989).

Three oat cultivars, Tibor, Fundy and OA 753-2 had yields of 2.6, 2.4, and 2.1 T/ha respectively. The mean oat yield was higher than wheat yields. This is to be expected as oats will tolerate stressful conditions better than wheat. The only barley in the test, Tupper, had a yield of 2.4 T/ha.

Across all species and all cultivars, lodging occurred in only 3 entries. Fundy oats and Lancer wheat had significant lodging ratings. Fertilizer nitrogen was not applied in this experiment, therefore lodging was not expected on even the weakest cultivars.

Assessment of the yield reducing effects of weeds, insects and diseases were not recorded. Observations made during the growing season and at harvest indicated that insect and disease damage were inconsequential. Weeds were present and could have reduced yields in some plots.

CONCLUSIONS: It appears that with proper crop rotation, acceptable yields of wheat, oats and barley can be achieved under organic production practices. Lodging of all grains, even with weak strawed cultivars, was very minimal.

ACKNOWLEDGMENTS: The authors would like to thank Mr. Thomas Schaffer for the use of his land and his help with land preparation and Mr. Stu Fleischaker for assistance in procuring cultivars for this study.

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TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF OATS, WHEAT AND BARLEY GROWN USING ORGANIC PRODUCTION MANAGEMENT PRACTICES

Cultivar	Yield (T/ha)	T.K.W. (g)	*Lodging
Max	2.7 a	26.8	0
Tibor	2.6 ab	29.6	0
Fundy	2.4 abc	28.2	0
Tupper	2.4 abc	32.9	0
Katepwa	2.3 bcd	27.9	0
OA 753-2	2.1 bcde	29.0	0
Roblin	2.0 cde	29.5	0
Columbus	1.9 de	25.9	0
Laura	1.9 de	24.6	0
Neapawa	1.9 de	25.0	0
Leader	1.8 de	22.1	0.02
Acadia	1.8 de	24.0	0
Lancer	1.8 e	23.2	0.22
Kenyon	1.8 e	24.8	0
Kyle	1.7 e	26.8	0
LSD (.05)	.43	1.59	0.14
C.V. %	14.50	4.18	199.7

* Harvest lodging - Belgium lodging scale

DURUM WHEAT CULTIVAR EVALUATION TRIAL 1989

D.F. Walker and A.O.M. Smith

ABSTRACT: Five western Durum wheat cultivars and 2 adapted cultivars were seeded on May 23, 1989 in an R.C.B. with 4 replications. The 2 adapted cultivars, Belvedere and Max, yielded significantly higher than all Durum cultivars at 4.3 and 3.7 T/ha respectively. The yield of the 5 Durum cultivars ranged from 2.8 to 2.1 T/ha.

ESSAI D'ÉVALUATION DE CULTIVARS DE BLÉ DURUM

Résumé: Cinq cultivars de blé de l'Ouest Durum et deux cultivars adaptés ont été semés le 23 mai 1989 dans un dispositif expérimental en bloc divisé au hasard et répété quatre fois. Les deux cultivars adaptés, Belvedère et Max, ont donné un bien meilleur rendement que tous les cultivars Durum, soit 4,3 et 3,7 tonnes à l'hectare respectivement. Le rendement des cinq cultivars Durum variait de 2,8 à 2,1 tonnes à l'hectare.

INTRODUCTION: The New Brunswick grain industry has been and continues to be geared to producing feed grains. Feed grains are the least demanding in terms of quality requirements and always command a very low price. One of the objectives of the N.B. Department of Agriculture is to evaluate higher valued grain crops. Two examples of high valued grain crops evaluated in the past were milling wheat and malting barley. The Durum wheat trial continues the evaluation of higher value crops.

MATERIALS AND METHODS: A wheat study consisting of 5 western Durum cultivars and 2 adapted cultivars was seeded on May 23, 1989 at Hartland N.B. A Wintersteiger plot seeder with a 12 cm row spacing was used to seed 350 viable kernels/m^2. Plot size was 2 m x 8.5 m in a R.C.B. design with 4 replications. Fertility consisted of 200 kg/ha 17-17-17 broadcast and incorporated at seeding. An additional 250 kg/ha 34-0-0 was broadcast on June 19, 1989. A tank mixture of Tilt (125 g ai/ha), Cycocel (200 g ai/ha) and Blagal (840 g ai/ha) was applied with a small plot sprayer at G.S. 13-14 (June 13, 1989). On Aug. 30, 1989 a Hege 125 B combine was used to harvest all plots.

RESULTS AND DISCUSSION: The plots were planted 12 days later than normal, therefore yields were expected to be low, however due to good growing conditions yields were close to normal. Belvedere, the adapted feed cultivar yielded 4.3 T/ha, significantly higher than Max and the 5 Durum cultivars (Table 1). Arcola was the highest yielding Durum cultivar at 2.8 T/ha, significantly higher than Medora, Sceptre and Wookoma at 2.3, 2.2 and 2.1 T/ha respectively. Arcola also had the highest thousand kernel weight of any cultivar in the trial at 44.8 g (Table 1). Dry conditions prior to heading caused the grain to be short and therefore lodging did not occur in any plots. Disease ratings were not recorded during the

growing season, however no Durum cultivar was observed to be more susceptible than Max or Belvedere to septoria, mildew, or fusarium. All 5 Durum cultivars were given a grade of Wheat No. 5 Canada Eastern Amber Durum. The major cause of the low grade was due to the concentration of Tombstone kernels.

CONCLUSIONS: Initial observations indicate that Durum wheat can be produced in N.B. Yields are low relative to adapted cultivars, but because of the higher value of Durum wheat, further study is justified. The evaluation of Durum wheat cultivars will continue in 1990.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF DURUM WHEAT CULTIVARS - HARTLAND, 1989

Cultivar	Yield (T/ha)	T.K.W. (g)	*Lodging
Belvedere	4.3 a	42.3 a	0
Max	3.7 b	38.2 b	0
Arcola	2.8 c	44.8 c	0
Kyle	2.4 cd	39.7 c	0
Medora	2.3 d	39.5 c	0
Sceptre	2.2 d	38.5 c	0
Wookoma	2.1 d	36.0 d	0
LSD (.05)	.51	2.0	
C.V. %	12.04	3.37	

* Harvest lodging - Belgium lodging scale

ACKNOWLEDGMENTS: The authors would like to express their appreciation to Harold Culberson for the use of his land to conduct this study.

MAX WHEAT PLANT GROWTH REGULATOR STUDY 1989

D.F. Walker and A.O.M. Smith

ABSTRACT: Max wheat was seeded at 350 viable kernels/m^2 at Hartland N.B. on May 23,1989. Cycocel, Ethephon, and Citowet Plus were applied at different rates, stages of growth and in various combinations. All plots were harvested Sept. 5, 1989. Yield, thousand kernel weight, kernels/head and lodging were unaffected by any plant growth regulator treatment. All plant growth regulator treatments significantly reduced plant height compared to the non-treated control.

ÉTUDE DE L'EFFET DE RÉGULATEURS DE CROISSANCE SUR LE BLÉ MAX 1989

Résumé: Du blé Max a été semé à raison de 350 grains viables par mètre carré à Hartland (N.-B.) le 23 mai 1989. Du Cycocel, de l'Ethephon et du Citowet Plus ont été appliqués à divers taux, à divers stades de croissance et en diverses combinaisons. Toutes les parcelles ont été récoltées le 5 septembre 1989. Aucun des traitements avec les régulateurs de croissance n'a eu d'effet sur le rendement, sur le poids de mille grains, sur le nombre de grains par épi et sur la verse. La hauteur de toutes les plantes traitées avec les régulateurs de croissance était beaucoup inférieure à celle des plantes témoins non traitées.

INTRODUCTION: Plant growth regulators shorten and stiffen the straw, thereby preventing lodging in grain. In the absence of lodging, growth regulators will not increase yields. Under stressful conditions, i.e. drought, lack of vigour, plant growth regulators can reduce yields. On weak strawed cultivars, growth regulators prevent lodging and result in: increasing yields and T.K.W.'s, improving quality and facilitating harvest. The growth regulator most often used on spring wheat is Cycocel. Cycocel is most effective at reducing lodging when applied at or just prior to G.S. 30.

The purpose of this experiment was to evaluate the effects of Cycocel, Ethephon and Citowet Plus on lodging of Max wheat at different rates, combinations and timings.

MATERIALS AND METHODS: Max wheat was seeded at Hartland, May 23, 1989 at 350 viable kernels/m^2 in an R.C.B. design with 4 replications. Plot size was 3 m x 8.5 m 200 kg/ha 17-17-17 was broadcast and incorporated prior to seeding and an additional 250 kg/ha 34-0-0 was broadcast on June 19, 1989. Blagal (840 g ai/ha) and Tilt (125 g a/ha) were tankmixed and applied at G.S. 13-14 (June 13, 1989) with a small plot sprayer. The treatments were applied at the G.S. and rate indicated in Table 1 using a precision CO_2 sprayer with a 2 m boom width. Various data were collected throughout the growing season. Lodging was recorded just prior to harvest according to the Belgium lodging scale. All plots were harvested Sept. 5, 1989.

RESULTS AND DISCUSSION: Grain yields, T.K.W.'s, kernels/head and lodging were not affected by any plant growth regulator. The lack of lodging in the untreated check treatment indicates there was little lodging pressure on the crop. This was due to a combination of Max being a strong strawed cultivar and dry conditions during the stem elongation period (G.S. 30-40). Growth regulators will not increase yield when lodging does not occur; therefore a yield response was not expected. Similarly, T.K.W. and kernels/head were not expected to show a significant difference.

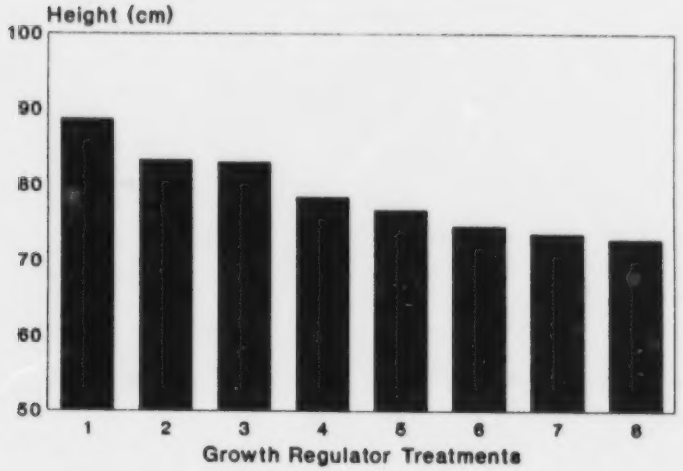
Although lodging did not occur, growth regulator response on plant height was highly significant in all treatments (Table 1). In treatments 6 and 8, the combination of Cycocel (0.93 kg ai/ha), Ethephon (.047 kg ai/ha) and Citowet (.05 % volume/volume), reduced plant height the most. Treatment 7, the low rate of Cycocel (.14 kg ai/ha) also strongly reduced plant height. The above three treatments were all applied after G.S. 32 indicating that the later a growth regulator is applied the greater the reduction in plant height (Table 1).

Treatments 3-5 were all applied at G.S. (23-31). Treatment 2 and 3 were identical with the exception of the addition of Citowet to treatment 3. Treatment 3 (73.8 cm) had a significantly shorter straw than treatment 2 (83.2 cm) indicating that the Citowet enhanced the activity of the Cycocel. A similar response was observed with treatments 4 and 5. Treatment 5 (76.6 cm) with the Citowet, had significantly shorter straw than treatment 4 (82.9 cm) with the same rate of Cycocel (Table 1). One would expect that the shorter strawed treatments would have greater resistance to lodging.

CONCLUSION: Application of growth regulators between G.S. 32-37 reduced plant height to a greater degree than the same rate of application at G.S. 23-31. The addition of Citowet to the spray mixture also significantly enhanced growth regulator activity. It also could be concluded that if a crop is not susceptible to lodging, the application of a growth regulator will not increase yields.

ACKNOWLEGMENTS: The authors would like to thank Harold Culberson for the use of his land to conduct this study.

Fig. 1: The effects of Plant Growth Regulators on height of Max Wheat



1 Check
2 CCC .14 kg ai/ha GS 23-31
3 CCC .23 kg ai/ha GS 23-31
4 CCC+● .14 kg ai/ha GS 23-31
5 CCC+● .23 kg ai/ha GS 23-31
6 CCC .14 kg ai/ha GS 32-37
7 CCC+E+● .093+.047 kg ai/ha GS 32-37
8 CCC+E+● .093+.047 kg ai/ha GS 37-45

CCC - Cycocel ● - Citowet (.05% v/v)
E - Ethephon

TABLE 1: THE EFFECT OF PLANT GROWTH REGULATORS ON PLANT HEIGHT AND OTHER AGRONOMIC CHARACTERISTICS OF MAX WHEAT - HARTLAND, 1989

Treatment	Rate (kg ai/ha)	Growth Stage	Yield (T/ha)	T.K.W. (g)	Kernels/ head	#Lodging	Plant Ht (cm)
Check			3.4	39.4	39.3	0	88.7 a
*CCC	.14	23-31	3.6	38.4	37.7	0	83.2 b
CCC	.23	23-31	3.4	38.8	39.1	0	82.9 b
*CCC+@	.14	23-31	3.3	37.3	39.2	0	78.3 c
CCC+@	.23	23-31	3.4	38.4	39.6	0	76.6 cd
CCC	.14	32-37	3.4	37.7	39.0	0	74.5 cd
*CCC+E+@	.093+.047	32-37	3.6	37.6	37.9	0	73.5 d
CCC+E+@	.093+.047	37-45	3.6	38.1	38.8	0	72.8 d
LSD (.05)							4.44
C.V. %			6.02	3.4	7.86		3.83

\# Harvest lodging - Belgium lodging scale

* CCC - Cycocel
CCC+@ - Cycocel + Citowet (.05 % volume/volume)
CCC+E+@ - Cycocel + Ethephon + Citowet (.05 % volume/volume)

HARRINGTON AND ARGYLE MALTING BARLEY FERTILITY TRIAL 1989

D.F. Walker and A.O.M. Smith

ABSTRACT: Harrington and Argyle barley were seeded at 350 viable kernels/m^2 on May 22, 1989 at Hartland N.B. All plots were harvested on Aug. 18,1989. Ammonium nitrate (A.N.) and urea were broadcast at 0, 30, 60, 90 kg N/ha. Neither nitrogen source or fertility level had any effect on yield of either barley. With Harrington both A.N. and urea acted in a similar manner, increasing lodging, plant height and percent protein as rates increased. A.N. and urea produced parallel results on Argyle barley: increasing lodging and decreasing thousand kernel weight's as fertility rates increased.

ESSAI D'ENGRAIS SUR LES ORGES DE BRASSERIE HARRINGTON ET ARGYLE

Résumé: De l'orge Harrington et de l'orge Argyle ont été semées le 22 mai 1989 à raison de 350 grains viables par mètre carré à Hartland (N.-B.). Toute la récolte a eu lieu le 18 août 1989. Du nitrate d'ammonium et de l'urée ont été épandus à la volée aux taux de 0, 30, 60, 90 kg/ha. La source d'azote et le taux d'application n'ont pas eu d'effet sur le rendement de ces variétés. Le nitrate d'ammonium et l'urée ont eu un effet similaire sur l'orge Harrington: la verse, la hauteur des plants et la teneur en protéines ont augmenté proportionnellement à l'augmentation des taux d'engrais. Pour l'orge Argyle, le nitrate d'ammonium et l'urée ont eu pour effet d'augmenter la verse et de diminuer le poids de mille grains proportionnellement à l'augmentation des taux d'engrais.

INTRODUCTION: Feed grain prices increased as a result of the drought in 1988, in 1989 prices have declined again, close to or below the cost of production. With exception of a small amount of wheat for milling and 4000-6000 T for seed, N.B.'s grain production is destined for the feed market. It is the lowest priced market available and a great many producers in Western Canada consider it a cull market of last resort. N.B. grain farmers should strive to produce higher value grain crops.

The N.B. Department of Agriculture is devoting some of its technology development expertise to researching the potential of these crops. The most promising higher value crops are milling wheat and malting barley. Unlike milling wheat, malting barley has never been produced in the province. However, the 1987 Cultivar Evaluation Trials (Walker et. al. 1987) indicate that malting barley production is possible. One small N.B. brewery and Canada Malting of Winnepeg have indicated that they are willing to work with growers in N.B. to produce malting barley. One of the main considerations in producing barley for the brewing industry is for the grain to have low protein. The greatest influence on grain protein is nitrogen, whether residual nitrogen from the previous crop or from fertilizer nitrogen application during the production year.

This study was initiated to determine the effects of fertilizer nitrogen applications on the grain % protein of Harrington and Argyle barley. A second objective of

this study was to determine the optimum nitrogen fertility level to achieve both desired grain protein levels (11-11.5%) and optimum yields.

MATERIALS AND METHODS: Harrington barley (2-row) and Argyle barley (6-row) were seeded at Hartland N.B., May 22 1989 at 350 viable kernels/m^2. A plot seeder with 12 cm row spacing was used to seed the study in a R.C.B. design with 4 replications. Each plot measured 3 m x 8.5 m. Two sources of fertility were used: urea and A.N. at 30, 60, 90 and 120 kg N/ha. Prior to seeding 200 kg/ha 17-17-17 was broadcast and incorporated. Treatments were applied as a single application at G.S. 10-12 (June 5, 1989). Blagal (840 g ai/ha) and Cycocel (200 g ai/ha) were applied at G.S. 13-14 (June 13, 1989). Prior to harvest, lodging (using the Belgium lodging scale) and other data were recorded. All plots were harvested Aug. 18, 1989 using a small plot combine.

RESULTS AND DISCUSSION: Neither nitrogen source or level had any significant effect upon yield, TKW, kernels/head of Harrington barley. This agrees with findings by Walker and Smith (1988). With Harrington, lodging, plant height and % protein were significantly increased with increasing rates of N from both A.N. and urea. Lodging ratings increased from 2.8 to 7.2 with the 0 and 90 kg N/ha respectively (Table 1). Plant height ranged from 77.7 cm to 82.4 cm when N levels increased from 30-60 kg N/ha. The 0 and 90 kg N/ha treatments were 78.1 cm and 78.6 cm respectively. The lack of a consistent trend in plant height could be explained by the high residual N levels from the previous potato crop. The high residual N levels also explain high % protein in the grain ranging from 13.6 to 14.8 (Table 1). These levels are much higher than the maximum 12.5 % acceptable in malting barley grades. Damp weather prior to harvest darkened kernels resulting in samples being downgraded to feed. In 1989, malting barley samples failed to make grade on two important criteria: protein and kernel colour.
High levels of residual N resulted in no significant differences in yield, kernels/head, plant height and protein from increased rates or sources of N fertility with Argyle barley. Late lodging increased from 1.2 - 60 and 1.2-6.6 with increases of 0-90 kg N/ha for A.N. and urea respectively. With both A.N. and urea, the TKW declined significantly at the highest N level. This could be explained mainly by lodging early in the season (Table 2).

CONCLUSIONS: High levels of residual N overshadowed any yield response due to N rate increases or sources. For the second year in a row, residual N levels and kernel discoloration has resulted in downgrading. Given the unpredictability of the N.B. climate, it appears that

barley of malting quality will be difficult to produce. Farmers should continue to assess the potential of growing higher valued crops but malting barley appears to have less potential than once perceived.

ACKNOWLEDGEMENTS: The authors would like to express their appreciation to Harold Culberson for the use of his land to conduct this study.

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Walker D.F., et. al. 1987. Malting barley cultivar evaluation trial. N.B. Dept. of Agriculture, Adaptive Research Report, 9:88-90.

TABLE 1: Agronomic Characteristics of Harrington Barley as Affected by Fertility Treatments - Hartland 1989

Fertility Level (Kg/ha)	Yield (T/ha)	T.K.W. (g)	Kernels/ head	*Early Lodging	*Late Lodging	Plant Height (cm)	Protein Content %
A.N. 0	4.2	43.6	24.1	1.9	2.8	78.1 ab	13.6 c
A.N. 30	4.6	42.0	23.4	4.7	5.6	77.7 ab	14.6 abc
A.N. 60	4.5	43.3	25.1	5.4	4.8	82.4 a	14.0 abc
A.N. 90	4.6	38.3	24.2	6.2	7.2	78.6 ab	14.8 ab
Mean	4.5	41.8	24.5	4.6	5.1	79.2	14.3
Urea 0	4.6	44.9	21.9	2.0	2.4	76.1 b	13.6 c
Urea 30	4.2	40.8	23.3	5.2	6.2	80.2 ab	13.9 bc
Urea 60	4.7	40.1	22.7	6.2	6.9	80.4 ab	15.0 a
Urea 90	4.4	41.6	23.9	7.2	8.5	80.9 ab	14.8 ab
Mean	4.5	41.9	23.0	5.2	6.0	79.4	14.3
LSD (.05)				2.64	2.96	5.74	1.04
C.V. %	9.33	8.38	6.28	37.03	36.49	4.93	4.93

* Lodging ratings - Belgium lodging scale

TABLE 2: Agronomic Characteristics of Argyle Barley as Affected by Fertility Treatments - Hartland 1989

Fertility Level (Kg/ha)	Yield (T/ha)	T.K.W. (g)	Kernels/ head	*Early Lodging	*Late Lodging (cm)	Plant Height	Protein Content %
A.N. 0	4.5	37.6	48.7	1.6	1.2	101.6	13.4
A.N. 30	4.8	37.7	53.3	4.6	4.3	102.2	13.1
A.N. 60	4.2	36.0	53.9	5.3	5.2	101.4	13.8
A.N. 90	4.8	34.7	55.9	6.6	6.0	100.3	14.0
Mean	4.6	36.5	53.0	4.5	4.2	101.4	13.6
Urea 0	4.5	37.5	52.0	1.3	1.2	101.2	14.1
Urea 30	4.9	37.4	56.4	3.9	2.7	101.5	14.1
Urea 60	4.9	37.5	53.2	6.2	3.2	101.7	13.8
Urea 90	4.3	34.9	52.8	6.8	6.6	100.9	14.6
Mean	4.7	36.8	53.6	4.6	3.7	101.3	14.2
LSD (.05)		1.43	3.94	2.06	1.67		
C.V. %	10.30	2.66	5.02	31.05	28.14	2.50	64.80

* Lodging ratings - Belgium lodging scale

Fig. 1: The effects of fertility level and source on % protein of Harrington Barley

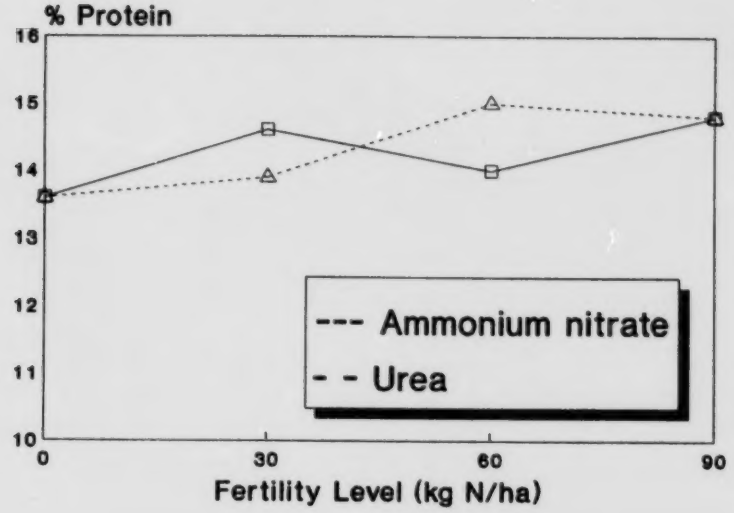


Fig. 2: The effects of fertility level and source on plant height of Harrington Barley

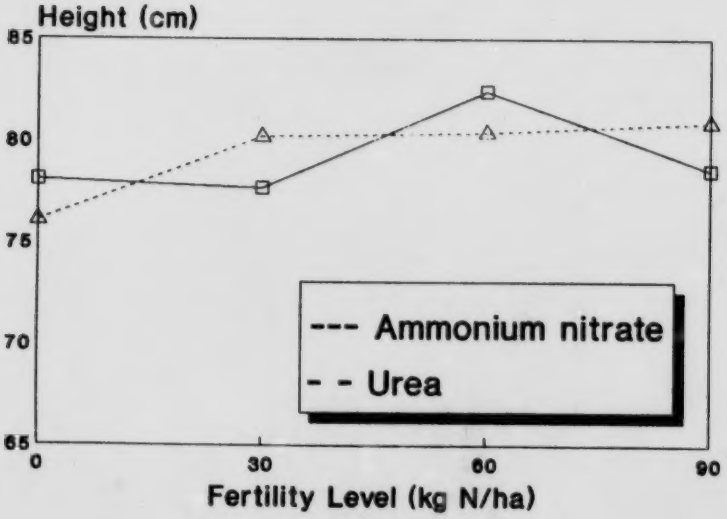
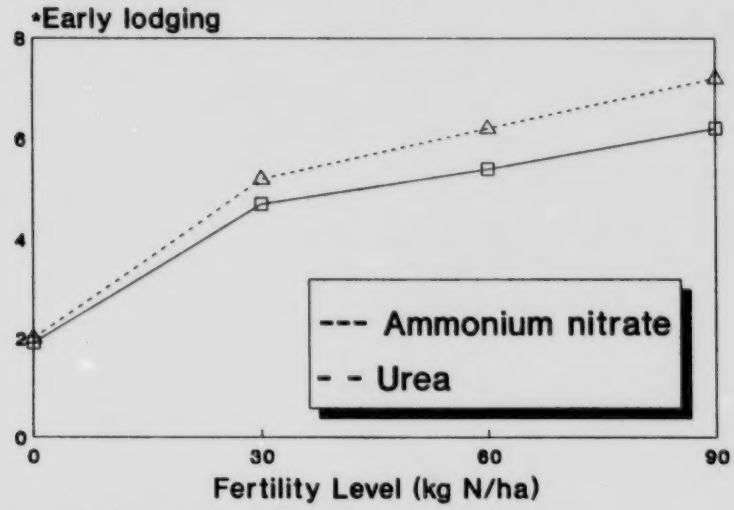
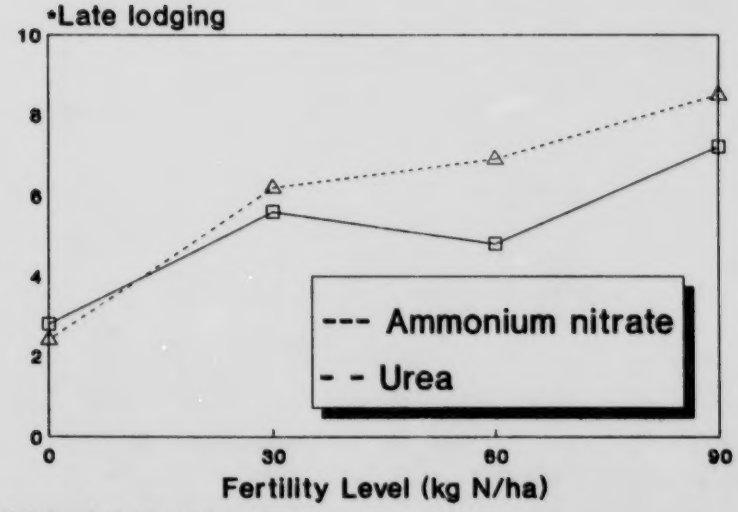


Fig. 3: The effects of fertility level and source on early lodging of Harrington Barley



* Belgium lodging scale

Fig. 4: The effects of fertility level and source on late lodging of Harrington Barley



* Belgium lodging scale

Fig. 5: The effects of fertility level and source on % protein of Argyle Barley

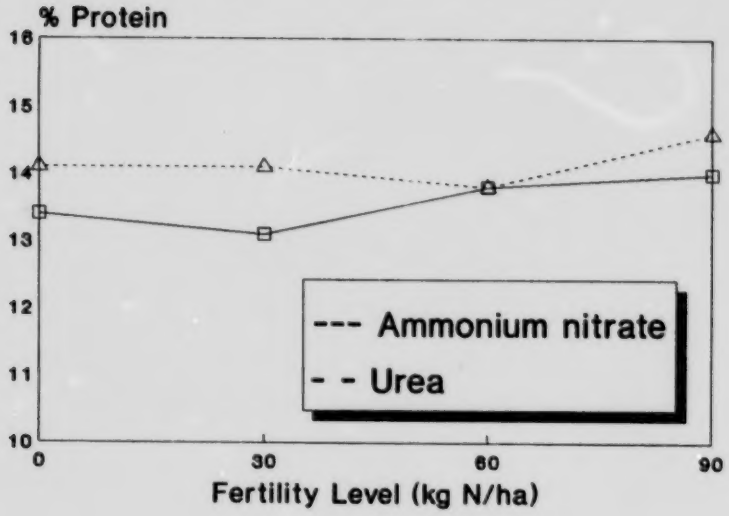


Fig. 6: The effects of fertility level and source on plant height of Argyle Barley

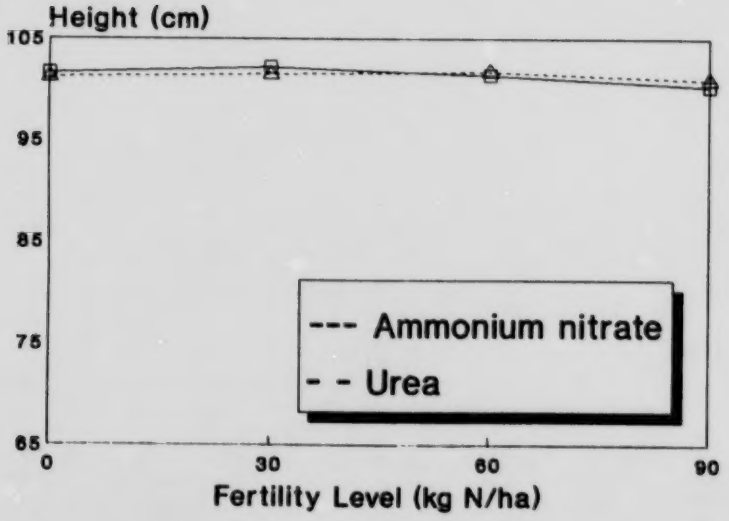
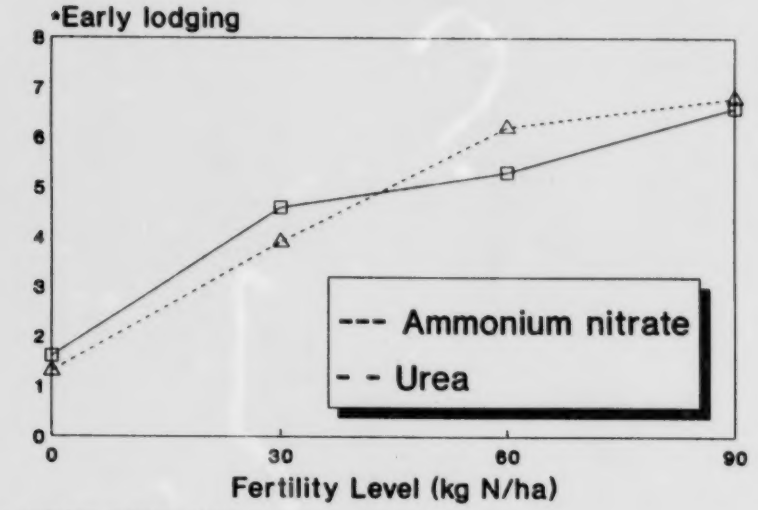
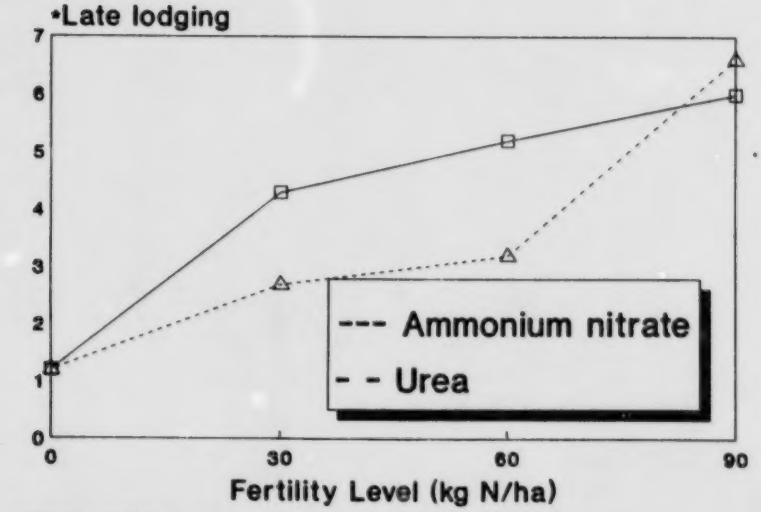


Fig. 7: The effects of fertility level and source on early lodging of Argyle Barley



• Belgium lodging scale

Fig. 8: The effects of fertility level and source on late lodging of Argyle Barley



• Belgium lodging scale

CHAPAIS BARLEY AND BELVEDERE WHEAT UNDERSEEDING STUDY 1989

D.F. Walker and A.O.M. Smith

ABSTRACT: Chapais barley and Belvedere wheat were underseeded with alfalfa, red clover, Italian rye grass, and triplemix in a R.C.B. design with 4 replications. The wheat, barley and forages were seeded at recommended rates on May 23, 1989. The barley was harvested on Aug. 19, 1989 and the wheat was harvested on Sept. 5, 1989. There were no significant yield differences in wheat or barley, in any of the underseeded treatments. Grain growth was very vigorous and severely restricted the growth of the underseeded forages.

ÉTUDE DE LA CULTURE EN SOUS-SEMIS DE L'ORGE CHAPAIS ET DU BLÉ BELVEDERE - 1989

Résumé: De l'orge Chapais et du blé Belvedère ont été contre-ensemencés avec de la luzerne, du trèfle violet, de l'ivraie multiflore et avec un triple mélange dans un dispositif expérimental en bloc divisé au hasard et répété quatre fois. Le blé, l'avoine et les plantes fourragères ont été semés aux taux recommandés le 23 mai 1989. L'orge a été récoltée le 19 août 1989 et le blé, le 5 septembre 1989. Nous n'avons pas obtenu de grands écarts de rendement pour l'orge ou le blé qui ont été contre-ensemencés. Ces céréales ont poussé très vigoureusement et ont grandement réduit la croissance des plantes fourragères avec lesquelles elles étaient contre-ensemencées.

INTRODUCTION: Farmers in N.B. have traditionally underseeded grain crops with forages. The N.B. Dept. of Agriculture has discouraged this practice because of difficulty in controlling weeds and a less than satisfactory forage stand the following year. Additional problems include: reduced combine efficiency, particularly in lodged grain and frequently, reduced yields due to competition.

Farmers continue to underseed grain crops with forages because of: A) the elimination of field work associated with establishing a forage crop separately the following year.
B) a fall cover crop after the grain has been removed can result in higher levels of organic matter in short rotations.
C) most farmers are convinced that the forage yield following the underseeded grain crop is higher than forages established separately.

Where organic methods of farming are practised and herbicides not used the underseeded forage crop will compete and reduce weeds. This study was undertaken to determine the effects on grain yield and lodging when underseeded with several forages.

MATERIALS AND METHODS: An underseeding study was planted at Hartland N.B. May 23, 1989. Chapais barley and Belvedere wheat were seeded in an R.C.B. design with 4 replications as a mixture with the following: alfalfa, Italian ryegrass, red clover, and triplemix (70-15-15). The wheat and barley were seeded at 350 viable kernels/m^2 and the forages were seeded at the recommended rate.

Prior to seeding, 200 kg/ha 17-17-17 was broadcast and incorporated and an additional 250 kg/ha 34-0-0 was broadcast June 19,1989. Embutox E (1.75 l product/ha), Tilt (125 g ai/ha), and Cycocel (200 g ai/ha) were applied at G.S. 13-14 (June 14, 1989) with a Hornstein sprayer. Barley plots were harvested on Aug. 19, 1989 and wheat plots were harvested on Sept. 5, 1989.

RESULTS AND DISCUSSION: There were no significant yield effects with either wheat or barley as a result of any underseeded treatments (Tables 1 and 2). Similarly thousand kernel weight and lodging were unaffected. Growing conditions at planting were ideal. Soil temperatures were high and moisture levels were excellent. The wheat and barley emerged quickly and continued to grow vigorously throughout the season. Because of the severe competition from the grain crop, all forages including Italian ryegrass established poorly and lacked vigour throughout the growing season. The narrow row spacing (12 cm) resulted in rapid ground cover and reduced light penetration during the growing season, which also reduced forage vigour.

CONCLUSION: Severe competition from the grain crop reduced forage vigour in all treatments to the point where there was no effect on yield, T.K.W. or lodging. This project will be continued in 1990 to further evaluate the effects of underseeding grain with forages.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF CHAPIS BARLEY - HARTLAND, 1989

Treatment	Yield (T/ha)	T.K.W. (g)	*Lodging
It Ryegrass	5.6	50.5	2
Triplemix	5.6	51.5	2
Alfalfa	5.5	50.8	0
Red Clover	5.5	52.4	1
Check	5.4	51.0	1
C.V. %	8.87	3.73	97.27

TABLE 2: YIELD AND AGRONOMIC CHARACTERISTICS OF BELVEDERE WHEAT - HARTLAND, 1989

Treatment	Yield (T/ha)	T.K.W. (g)	*Lodging
Alfalfa	5.2	43.2	0
Red Clover	5.2	41.4	0
It Ryegrass	5.1	41.2	0
Check	5.0	39.9	0
Triplemix	4.9	41.4	0
C.V. %	8.07	5.30	

* Harvest lodging - Belgium lodging scale

ACKNOWLEDGEMENTS: The authors would like to thank Harold Culberson for the use of his land to conduct this study.

MALTING BARLEY EVALUATION 1989

D.F. Walker and A.O.M. Smith

ABSTRACT: Yield and agronomic characteristics of 24 Western Canadian malting barley lines were evaluated in a 4 replicate R.C.B. study. Plots were seeded at 350 viable kernels/m^2 on May 22 1989 and harvested on Aug. 18 1989 with a small plot combine. Yields ranged from 5.3 to 3.6 T/ha. Thousand kernel weights were very high ranging from 48.9 g to 37.0 g. Lodging occurred but was not a factor in yield or harvesting. Frequent rains prior to harvest caused discolouration, downgrading all malting lines to feed quality.

ÉVALUATION DE VARIÉTÉS D'ORGE DE BRASSERIE - 1989

Résumé: Le rendement et les caractéristiques agronomiques de vingt-quatre variétés d'orge de brasserie de l'Ouest canadien ont été évalués dans un dispositif expérimental en bloc divisé au hasard et répété quatre fois. L'ensemencement a eu lieu le 22 mai 1989 à raison de 350 grains viables par mètre carré et la récolte, le 18 août 1989 avec une moissonneuse-batteuse pour petites parcelles. Les rendements variaient de 5,3 à 3,6 t/ha. Le poids de mille grains était très élevé et variait, selon les variétés, de 48,9 à 37 grammes. La verse s'est manifestée mais n'a pas affecté le rendement ni la récolte. Des pluies fréquentes avant la récolte ont causé la décoloration des grains, et toutes les variétés ont été disqualifiées pour l'alimentation humaine et sont tombées dans la catégorie des aliments pour animaux.

INTRODUCTION: Normal growing conditions have returned to the major grain growing regions of North America resulting in an increase in surplus feed grains. Prices have declined relative to 1988 and grain growers are again receiving prices for their crop at or below the cost of production. N.B. farmers are again questioning the economics of growing grain. Many N.B. farmers grow grain for the rotational benefits and not for it's economic returns. The N.B. Department of Agriculture has evaluated a number of high value specialty grains. These include: milling wheat, malting barley and Durum wheat. In 1987 the malting barley trials produced excellent yields of high quality grain. Eight of the 10 lines in the test achieved the top grade for malting barley, Special Select CE (Walker et.al. 1987). In both 1988 and 1989 wet conditions just prior to harvest caused kernel discoloration, downgrading most lines to feed quality. This study is part of the ongoing evaluation of malting lines for their eventual production in N.B.

MATERIALS AND METHODS: A malting barely study consisting of 24 lines was planted May 22, 1989 at Hartland N.B. A Wintersteiger plot seeder with a 12 cm row spacing was used to seed 350 viable kernels/m^2. Plot size was 2 m x 8.5 m in an R.C.B. design with 4 replications. Fertility consisted of 200 kg/ha 17-17-17 broadcast and incorporated at seeding. An additional 250 kg/ha 34-0-0 was broadcast on June 19, 1989. A tank mixture of Tilt (125 g ai/ha), Cycocel (200 g ai/ha) and Blagal (840 g ai/ha) was applied with a small plot sprayer at G.S. 13-14 (June 13, 1989). On Aug. 18, 1989 a Hege 125 B combine was used to harvest all plots.

RESULTS AND DISCUSSION: In spite of the short growing

season, malting barley yields (Table 1) for 1989 were very high. Four lines TR604, BT631, BT490, and BT483 produced yields of 5 T/ha or more; equal to or greater than the highest 2-row line from treatment 1 of the Production Management (PM) trial. In treatment 1 of the 6-row Production Management (PM) trial there were only 2 cultivars that had higher yields than the highest malting barley line. All 3 tests: the malting barley trial, treatment 1 of 6-row PM barley, and treatment 1 of 2-row PM barley had similar fertility levels. This indicates that under similar conditions malting barley yields are close to those of adapted feed cultivars. Producers would not experience an unacceptable yield decline if they grew malting cultivars every year in an attempt to produce malting barley. These findings were also found by Walker et. al. (1987). Malting quality grain, particularly the criteria for colour, is much harder to achieve than originally anticipated. In only 1 year in the past 3 was grain quality satisfactory to meet malting requirements. In 1989 no lines attained malting quality due to colour caused by weathering.

Thousand kernel weight's in 1989 were high, exceeding those of 1988 and 1987 (Walker et. al. 1987, Walker et. al. 1988). It appears the malting lines had weaker straw than the adapted feed types used in PM 2-row and PM 6-row. Further testing is required to identify those lines that have acceptable straw strengths (Table 1).

Trials were seeded on May 23, 1989 and harvested Aug. 18, 1989 a period of only 87 days, 10 days less than normal to mature barley. This could be due to a later than normal planting date and a high heat unit accumulation during the growing season.

CONCLUSIONS: Malting barley lines continue to produce high yields. Excess moisture prior to harvest caused kernel discolouration resulting in downgrading. Even though quality was disappointing the high yields are sufficient evidence to continue testing.

ACKNOWLEDGEMENTS: The authors would like to thank Harold Culberson for the use of his land to conduct this trial.

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Walker et. al. 1988. Malting barley cultivar evaluation trial. Adaptive Research Report N.B. Dept of Agriculture. 10:56-59.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF MALTING BARLEY LINES - HARTLAND, 1989

Line	Yield (T/ha)	T.K.W. (g)	*Lodging
TR 604	5.3 a	45.3	1.2
BT 631	5.2 a	44.3	2.0
BT 490	5.1 abc	43.6	0.6
BT 483	5.0 abcd	39.7	3.7
TR 107	4.9 abcd	44.8	2.0
TR 441	4.9 abcde	46.6	1.5
BT 496	4.8 abcdef	39.3	2.3
TR 934	4.7 bcdef	45.5	0.0
BT 495	4.7 bcdefg	38.3	1.3
BT 481	4.7 bcdefg	39.6	2.2
TR 937	4.7 bcdefg	41.9	0.3
TR 114	4.6 cdefg	46.1	0.9
BT 486	4.6 cdefg	37.3	1.0
TR544	4.5 defg	48.9	0.5
TR212	4.5 defg	44.1	0.2
BT 120	4.4 efg	36.8	0.7
TR 226	4.3 efg	44.5	0.3
BT 346	4.3 fg	38.9	0.0
BT 922	4.3 fg	41.0	0.7
BT 492	4.3 fg	38.4	1.4
BT 308	4.2 fg	39.5	1.4
TR 309	4.1 gh	39.6	4.6
TR 112	4.1 gh	39.3	0.1
TR 307	3.6 h	37.0	1.6
LSD (.05)	.57	2.85	1.68
C.V.	8.87	4.85	95.29

* Harvest lodging - Belgium lodging scale

THE EFFECTS OF SOIL DARKENING ON THE EMERGENCE OF SOYABEAN

George Read

ABSTRACT: A soil darkening material, a latex base product called Polysar, was applied to four five meter double rows of soyabeans on the farm of Harold Culbertson near Woodstock, New Brunswick. Emergence data taken three weeks after the application of the product indicated no significant differences due to treatment, however the plants suffered emergence problems due to disease probably resulting from a lack of seed treatment prior to planting.

EFFET DU NOIRCISSEMENT DU SOL SUR LA LEVÉE DU SOJA

Résumé: Un agent de noircissement du sol, c'est-à-dire un produit à base de latex appelé Polysar, a été appliqué dans quatre rangées doubles de cinq mètres de soya sur la ferme de M. Harold Culbertson près de Woodstock (N.-B.). Le comportement de la levée enregistré trois semaines après l'application du produit n'indique pas de grande différence par suite du traitement, mais les plants ont eu des problèmes de levée en raison d'une maladie probablement due à l'absence de traitement des semences avant la plantation.

INTRODUCTION: The growing season for soyabean production in New Brunswick is limited for most areas. It is therefore desirable to increase the heat available to the plants. In some high value horticultural crops this modification becomes an economical option as is the case with using plastic or establishing windbreaks. However for large scale field crops with lower returns per acre it is necessary to keep costs very low when trying to improve the growing environment.

It has long been known that dark coloured surfaces warm up quicker and to higher temperatures than lighter surfaces. At the Hoyt provincial nursery, soil temperatures under a treatment of spraying the surface with a mixture of carbon and water, showed on average one to two degrees(C) warmer conditions at 20 cm. than untreated soil (Read, 1987a). The costs of this treatment could be kept to less than 10 dollars/acre if powdered coal dust was available. A trial of this treatment on cucumbers at Hoyt showed excellent yield increases over control plots (Read, 1987b).

The objective of this trial was to advance germination, growth, and maturity, and to determine the affects on yield.

One problem with a water-carbon mixture is its susceptibility to washing away in a heavy rain. A latex-based product similar to paint, called Polysar was tried in an effort to have the darkening influence remain on the soil a longer time.

MATERIALS AND METHODS: A latex based product, polysar, was applied to four replicates of double rows of

soyabeans, five meters long. Observations on emergence were made three weeks after the application. Yield estimates were not taken on the plots due to disease problems arising from using untreated seed.

RESULTS AND DISCUSSION: The emergence was slightly higher under the Polysar treatment at a point three weeks after application of the soil darkening material but the results were not significantly different. An assessment of the potential of this product for yield enhancement and therefore economic viability was not completed due to disease problems. The material did remain on the soil for several weeks after application through several rain events.

ACKNOWLEDGEMENTS: The trial was conducted with the assistance of Peter Scott and Danny Shaw from the N.B. department of Agriculture and through the cooperation of Mr. Harold Culbertson.

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SHORT SEASON SOYBEAN CULTIVAR EVALUATION TRIAL

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ABSTRACT: Thirty cultivars of Soybeans were seeded at Hartland in a 4 replicate RCB design in order to evaluate yield potential and agronomic characteristics.
Highest yields of 3.88 and 3.75 T/ha were produced by cultivars APACHE and OAC SCORPIO, respectively, with the lowest yield being produced by MAPLE PRESTO at 2.37 T/ha. BICENTENNIAL had the highest 100 seed weight of 19.18 g.; BARON had the highest pod height of 11.5 cm and OAC SCORPIO had the highest plant height of 78.5 cm.

EVALUATION DES VARIÉTÉS HÂTIVES DE FÈVES SOYA

Résumé: Trente variétés de soya ont été semées à Hartland dans un dispositif expérimental en blocs divisés au hasard qui a été répété quatre fois afin d'évaluer leur rendement et leurs caractéristiques culturales.

Les variétés APACHE et OAC SCORPIO ont donné le plus haut rendement, produisant respectivement 3,88 t/ha et 3,75 t/ha alors que la variété MAPLE PRESTO (2,37 t/ha) a donné le rendement le moins important. La variété BICENTENNIAL a donné le poids par 100 grains le plus élevé (19,18 g), la variété BARON, les cosses les plus hautes (11,5 cm) et la variété OAC SCORPIO, le plus haut plant (78,5 cm).

INTRODUCTION: Soybeans in the past have not played a very important role in New Brunswick Agriculture due mainly to the late maturity and low yield potential of available varieties. Through the breeding program of Dr. H. Voldeng of the Research Station in Ottawa, a number of crosses have been selected that show great potential for short season climates such as New Brunswick.

Through this trial, it is hoped that potential varieties can be selected that will perform well under the climatic conditions of New Brunswick, in particular suitable to production within the traditional potato-grain rotation.

MATERIALS & METHODS: Thirty soybean cultivars were seeded in a 4 replicate RCB design at Hartland on May 22. Prior to seeding a PPI application of 2.0 L/ha Treflan was used as a weed control and seeding was conducted using a small plot seeder. Plot area received a blanket broadcast application of 300 kg/ha, 17-17-17 fertilizer. Plant height, pod height, lodging ratings (1-5) were all taken prior to harvest. Harvesting was conducted on October 18th and 26th by hand to assure harvest of the bottom pods and then thrashed through a Hege 125B plot combine. Yield and yield components were evaluated and recorded after threshing.

RESULTS AND DISCUSSION: The top varieties of APACHE and OAC SCORPIO had the highest yields followed closely by three Atlantic recommended varieties of KG 30, McCALL and MAPLE ARROW (Table 1). These top yielding varieties all have heat unit requirements of 2550 CHU's or over and the heat unit accumulation for the Hartland area was in excess of 2700 CHU. Lower heat unit varieties such as MAPLE PRESTO produced the lowest yields, however maturity was much earlier.

TABLE 1: YIELD & AGRONOMIC CHARACTERISTICS OF SOYBEAN CULTIVAR EVALUTATION TRIAL
HARTLAND, NEW BRUNSWICK - 1989

CULTIVAR	YIELD T/HA		POD HEIGHT (cm)	PLANT HEIGHT (cm)	100 SEED WEIGHT (g)	LODGING (1-5)*
APACHE	3.88	A**	9.50	72.75	17.19	1.75
OAC SCORPIO	3.75	AB	9.25	78.50	16.14	2.25
OT84-14BR	3.60	ABC	8.50	74.25	15.62	2.25
KG 30	3.56	ABCD	7.75	74.50	12.85	1.50
OT87-4	3.50	ABCDE	9.25	64.75	14.66	1.50
MAPLE GLEN	3.46	ABCDEF	8.50	68.75	17.76	2.00
McCALL	3.44	ABCDEF	7.75	69.25	13.02	1.00
MAPLE ARROW	3.41	ABCDEF	9.25	71.00	16.58	1.50
LESOY 387	3.41	ABCDEF	7.75	68.00	16.25	1.00
OT88-11	3.40	ABCDEF	9.75	65.00	13.29	1.00
KG 20	3.35	ABCDEF	8.75	59.25	16.20	1.00
OT89-24	3.31	ABCDEF	7.50	47.75	16.09	1.00
BICENTENNIAL	3.30	ABCDEF	8.75	67.25	19.18	1.25
OT89-23	3.29	ABCDEF	9.25	64.00	15.63	1.75
OT89-22	3.28	ABCDEF	8.75	64.00	16.12	1.00
KG 40	3.26	ABCDEFG	8.25	52.25	15.04	1.00
OT87-7	3.18	ABCDEFG	8.50	51.00	13.98	1.00
MAPLE AMBER	3.12	BCDEFG	10.25	66.50	16.07	1.00
BARON	3.12	BCDEFG	11.50	54.00	17.05	1.00
OT89-21	3.11	BCDEFG	10.75	66.50	13.64	1.75
OT88-10YH	3.05	BCDEFGH	8.25	55.00	14.05	1.00
QS 39.21	2.91	CDEFGH	8.50	62.75	15.64	1.50
MAPLE RIDGE	2.90	CDEFGH	7.50	52.00	13.93	1.00
OT89-16	2.87	DEFGH	9.75	67.00	14.60	1.00
OT88-8	2.83	EFGH	9.50	60.25	13.71	1.00
MAPLE ISLE	2.75	FGH	7.75	60.50	16.52	1.00
MAPLE BELLE	2.75	FGH	8.75	54.75	16.05	1.50
OT87-12	2.55	GH	8.50	46.25	14.48	1.00
GO 173	2.37	H	8.50	48.50	15.48	1.00
MAPLE PRESTO	2.37	H	8.50	55.50	14.29	1.00
LSD(.05)	0.71		1.78	9.32	0.63	
CV (%)	16.01		14.32	10.68	2.92	

* LODGING SCALE 1.0 = ERECT, 5.0 TOTALLY LODGED.
** YIELD MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

Pod height is an important factor in variety selection. Varieties with high pod heights are favourable due to the low pods being easily lost in mechanical harvesting. The varieties BARON, OT89-21 and AMBER had the highest pod heights however, their respective yields were not high. Plant heights and lodging compare closely, that is the taller the plant the greater the lodging (Table 1).

CONCLUSIONS: Delays in seeding (due to excessive rainfall) and a long wet period after seeding (causing a reduced emergence) was compensated by an excellent growing season with adequate moisture and above average heat unit accumulation.

Results of this trial reinforce any speculation that soybeans can be an alternative or supplemental crop to be grown commercially in New Brunswick.

ACKNOWLEDGEMENTS: The authors wish to express thanks to Harold Culberson and Sons for assistance and for use of plot land.

To Dr. H. Voldeng for supplying the seed and the opportunity to conduct this trial.

Ref: Table.soy

Herbicide Evaluation at Three Different Growth Stages in Barley

K.V. McCully, D. O. Hanscomb, M.A. Mann

ABSTRACT: A trial to evaluate six herbicides applied to barley at growth stage 12, 22 and 31 was established. Yields and visual assessments on crop tolerance and weed control were collected. Results indicated that crop tolerance varied depending on herbicides and growth stages at which they were applied. Herbicides applied at growth stage 31 generally resulted in the most crop damage while there was little difference between herbicides applied at growth stage 12 and 22. Regardless of application timing, dicamba appeared to be the most phytotoxic to barley while cyanazine/MCPA and bromoxynil/MCPA treatments were the least. Although yield differences existed between treatments and application timings, none were significantly different from the control. Best overall weed control, regardless of application timing resulted from DPX-M6316 + Agral 90, followed by cyanazine/MCPA and dicamba/MCPA.

ÉVALUATION D'HERBICIDES APPLIQUÉS DANS DES CULTURES D'ORGE À TROIS DIFFÉRENTS STADES DE CROISSANCE

Résumé: On a procédé à un essai afin d'évaluer six herbicides appliqués dans des champs d'orge aux stades de croissance 12, 22 et 31. Des données sur le rendement ont été recueillies et l'on a fait l'inspection visuelle de la tolérance des plantes et de l'efficacité des herbicides. Les résultats indiquent que la tolérance des plantes varie en fonction des herbicides et du stade de croissance auquel ils sont appliqués. Les herbicides appliqués au stade 31 ont causé le plus grand nombre de dommages à l'orge, et l'on a relevé très peu de différence entre les herbicides appliqués aux stades 12 et 22. Sans tenir compte du moment de l'application, le dicamba semble être le produit le plus phytotoxique pour l'orge, tandis que les produits les moins phytotoxiques sont le cyanazine/MPCA et le bromoxynil/MPCA. On a enregistré des écarts de rendement selon les traitements et le moment de l'application, mais ils n'étaient pas très importants par rapport à ceux observés sur l'orge non traitée. Le produit ayant une efficacité générale supérieure, sans tenir compte du moment de l'application, est le mélange DPX-M6316 + Agral 90, suivi par le mélange cyanazine/MPCA + dicamba/MPCA.

INTRODUCTION: Weed control is one of the most critical components of a successful cereal production progam. Weeds can reduce yields by competing for moisture, nutrients, light and space. If herbicides are to be used, application timing is critical. Each herbicide has an optimal time for application and if misapplied can reduce yields and crop quality. A trial was therefore established to evaluate a number of herbicides applied at various barley growth stages. Herbicides were applied at Zadoks growth stage 12, 22 and 31 representing early, optimal and late application timings respectively.

MATERIALS AND METHODS

The trial was established in Hartland, Carleton County in a loam soil having a pH of 6.3 and an organic matter content of 2.7%. Chapais barley was planted on May 23, 1989 at a seeding rate of 359 kernels/m^2. Inter row width was 12.5 cm. Fertilizer application consisted of 80 kg/ha N, 35 kg/ha P_2O_5, and 75 kg/ha K_2O. Experimental design was a randomized complete block in a split plot with main plot units being the herbicide and the sub plots being timing. Plot size was 3m x 8.5m and replicated four times. Previous crop was potatoes. Herbicides (see Table 1) were applied on the following dates and growth stages: June 7 - growth stage 12, June

14 - growth stage 22, and June 21 - growth stage 31. Treatments were applied using a CO_2 backpack sprayer in a water volume of 200L/ha at a pressure of 207 kPa. Rainfall within 10 days of application date was: June 7 - 13 mm, June 14 - 11.4mm and June 21 - 14.6mm. Visual assessments on crop phytotoxicity and weed control were taken June 21, June 28, July 12, July 20, August 4, August 18 and August 25. Harvest was August 25. Logarithmic transformations were performed on the visual ratings and yields. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSIONS

CROP DAMAGE & YIELDS

Fourteen days after application to each of the various growth stages, visual ratings were collected. Results indicated that crop tolerance varied between herbicides depending upon the growth stage the herbicides were applied (See Table 1). For MCPA the best stage for application was at growth stage 12. This timing resulted in the highest yields and had the lowest associated crop damage of the three MCPA application timings. The presence of a gradient in some of the MCPA plots made damage ratings appear higher than expected at growth stage 22. MCPA damage symptoms on barley appeared in the form of a slight stunting and a pale coloration.

Barley treated with dicamba/MCPA (Dyvel D.f.) appeared most sensitive at growth stage 31. At this stage, yields were the lowest and crop damage relatively high. Initial damage was observed at the other growth stages but recovery was good with minimal final crop damage. Dicamba /MCPA damage was characteristic of dicamba. When applied at growth stage 12 dicamba/MCPA caused a flattening of the grain. When applied at growth stage 31 dicamba caused the flag leaf to lie flat instead of upright.

Barley treated with cyanazine/MCPA (Blagal) was most sensitive when applied at growth stage 31. This was evident at 14 and 28 days after application when evaluating crop damage and final yields. Overall however, barley treated with cyanazine/MCPA appeared to be quite tolerant regardless of treatment timing. Cyanazine/MCPA damage symptoms appeared as a yellowing to some leaves.

Barley treated with DPX-M6316 + Agral 90 (Refine + Agral 90) was most sensitive when applied at growth stage 31. This was evident when examining crop phytotoxicity and crop yields. Early damage was also evident from applications made at growth stage 12. By the final

Table 1. Yields and Visual Evluations of Crop Damage and Weed control.

TREATMENT	APPLICATION TIMING GROWTH STAGE Zadok	RATE Kg (a.i./ha)	% CROP DAMAGE 14 DAYS AFTER EACH APPLICATION	% CROP DAMAGE 28 DAYS AFTER EACH APPLICATION	% CROP DAMAGE Aug.18	% WEED CONTROL Aug.25	YIELDS t/ha
Control	12	-	0.0	0	0.0d	0.0c	4.53 NS
	22	-	0.0	0	0.0d	0.0c	4.59
	31	-	0.0	0	0.0d	0.0C	4.43
MCPA	12	0.85	8.8	3.4	5.0bcd	50.0B	4.95
	22	0.85	13.8	5.0	7.5ab	66.3ab	4.81
	31	0.85	7.0	13.8	5.0bcd	63.3ab	4.64
Dicamba/MCPA D.F.	12	0.50	3.8	7.3	3.8bcd	79.5ab	5.26
	22	0.50	11.3	7.5	1.2d	80.0ab	5.13
	31	0.50	6.3	23.8	5.0bcd	76.2ab	4.10
Cyanazine/MCPA	12	0.84	0.0	8.4	0.0d	94.5a	4.77
	22	0.84	6.3	0	1.3d	91.3a	4.08
	31	0.84	7.5	15	0.0d	98.3a	3.83
DPXM 6316+ Agral 90	12	0.15+0.2% v/v	12.5	10.0	0.0d	98.3a	4.64
	22	0.15+0.2% v/v	8.8	2.5	0.0d	94.5a	4.82
	31	0.15+0.2% v/v	8.4	16.3	1.3d	93.3a	4.09
Dicamba D.F.	12	0.11	0.0	1.8	1.3cd	47.5b	5.02
	22	0.11	3.8	8.8	6.3bc	46.3b	4.61
	31	0.11	6.4	37.5	11.3a	95.8a	4.72
Bromoxynil/MCPA	12	0.56	0.0	3.0	0.0d	54.5b	4.33
	22	0.56	5.0	0	0.0d	66.5ab	4.87
	31	0.56	6.5	12.5	2.5d	54.5b	3.67

*means with the same letter are not significantly different at the 0.05 level of significance according to the Duncan's multiple range test.

evaluation date (Aug.18) however the barley had recovered. Reports have indicated that the Agral 90 rate (0.2% v/v) may be too high and resulted in some of the initial damage. DPX-M6316 + Agral 90 damage characteristics, after application to growth stage 12, appeared as a general stunting and yellowing of barley.

Barley treated with dicamba (Banvel D.F.) was most sensitive when applied at growth stage 31 and least sensitive when applied at growth stage 12. Higher than expected damage resulted at growth stage 22. Damage characteristics included a general flattening of the barley at the early stages and a horizontal flag leaf when applications were made at the later growth stages. Barley height did not appear to be reduced.

Barley treated with bromoxynil/MCPA (buctril M) was most sensitive when applied at growth stage 31. Crop damage and yield reduction were greatest at this time. Relatively little damage resulted from applications made at growth stage 12 or 22. Damage symptoms included a very slight crop stunting.

Although yields varied between treatments and timings, there were no significant differences as compared to the controls. Yields from growth stage 31, however were all lower than the control.

Applications made at growth stage 22, displayed the most crop damage 14 days after application. However, by 28 days after application and the final August 18 evaluation date, damage symptoms were more pronounced from applications made at growth stage 31. The only treatments with significantly higher crop damage than the untreated controls by the Aug. 18 evaluation date however were dicamba D.F. applied at growth stage 31, MCPA applied at growth stage 22, and dicamba D.F. applied at growth stage 22. Overall, dicamba D.F. appeared to be the most phytotoxic to barley. Barley was least sensitive to cyanazine/MCPA and bromoxynil/MCPA treatments. Overall, by the final ratings dicamba, MCPA and dicamba/MCPA were the most phytotoxic followed by bromoxynil/MCPA, cyanazine/MCPA and DPX-M6316 + Agral 90.

WEED CONTROL

As compared to the control, all treatments significantly controlled weeds throughout all the rating periods. Treatments resulting in over 90% weed control by the August 25 rating date included DPX-M6316 + Agral 90 (applied at growth stage (G.S. 12) (98.2%); cyanazine/MCPA (G.S.31) (98.2%); DPX-M6316 + Agral 90 (G.S.31) (98.2%); dicamba D.F. (G.S. 31) (95.7%); DPX-M6316 + Agral 90 (G.S.22) (94.5%); cyanazine/MCPA (G.S.

12) (94.9%) and cyanazine/MCPA (G.S.22) (91.3%) (See Table 1). The best overall weed control treatments regardless of application timing, resulted from DPX-M6316 + Agral 90 (97.0%), followed by cyanazine/MCPA (94.7%); dicamba/MCPA (78.6%), dicamba D.F. (63.2%), MCPA (59.8%) and bromoxynil/MCPA (58.5%). There were no significant differences in weed control between the three application timings.

CONCLUSIONS

Crop tolerance varied between herbicides and growth stages to which the herbicides were applied. Barley treated with MCPA was surprisingly somewhat sensitive at all growth stages, but recovery and yields were best from applications applied at growth stage 12. There appeared to be a gradient in the field where some of the MCPA plots were located, resulting in the higher than expected damage ratings. Evaluation of crop tolerance and yields indicated that dicamba/MCPA, cyanazine/MCPA, DPX-M6316 + Agral 90, bromoxynil/MCPA and dicamba treated barley appeared to be most sensitive when applied at gowth stage 31. Visually, dicamba resulted in the most barley damage regardless of application timing. Barley was most tolerant to dicamba when applied at growth stage 12. Barley was most tolerant to cyanazine/MCPA and bromoxynil/MCPA throughout the rating periods. The DPX-M6316 + Agral 90 treatments resulted in high initial damage but fully recovered by harvest.

Although yield differences existed between treatments and application timings, none were significantly different from the control. Overall, applications applied to growth stage 31 appeared to be the most phytotoxic to barley. There was little difference between applications applied at growth stage 12 or 22 when comparing yields or final crop damage ratings.

Overall dicamba, followed by MCPA and dicamba/MCPA were the most phytotoxic to barley regardless of application timing. DPX-M6316 + Agral 90, cyanazine/MCPA and bromoxynil/MCPA were the least toxic to the barley, regardless of application timing.

Significant weed control resulted from all treatments throughout the rating periods. Best overall weed control, regardless of application timing resulted from DPX-M6316 + Agral 90 followed by cyanazine/MCPA and dicamba/MCPA. There was no significant differences in weed control between the three timings.

Best overall treatments, in terms of weed control and crop tolerance, regardless of application timing were DPX-M6316 + Agral 90 and cyanazine/MCPA.

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WILD OAT CONTROL IN BARLEY

K.V. McCully, D.O. Hanscomb, R. Robichaud

ABSTRACT: A trial to evaluate various herbicides and mixtures for their effectiveness in controlling wild oats and broadleaf weeds in barley was established. Visual ratings on wild oat control, broadleaf weed control and crop tolerance were collected. All treatments resulted in significant wild oat control. HOE 6001-02H and HOE 6001-02H + DPX M6316 were the most phytotoxic in terms of crop stunting. The most effective treatment for wild oat and broadleaf weed control was diclofop methyl + DPX M6316 (Refine) followed by AC222, 293 + MCPA ester and ICIA 0604 + MCPA ester + S.O.C.

SUPPRESSION DE LA FOLLE AVOINE DANS LES CULTURES D'ORGE

Résumé: Un essai a eu lieu pour évaluer l'efficacité de divers herbicides et mélanges contre la folle avoine et les mauvaises herbes à larges feuilles dans les champs d'orge. On a procédé à des évaluations visuelles de la suppression de la folle avoine et des mauvaises herbes à larges feuilles et des dommages causés aux plantes. Tous les traitements ont été efficaces contre la folle avoine. Le produit HOE 6001-02H et le mélange HOE 6001-02H + DPX M6316 ont été les plus phytotoxiques en ce qui concerne l'arrêt de croissance des plantes. Le traitement le plus efficace contre la folle avoine et les mauvaises herbes à larges feuilles était le diclofop méthyl + DPX M6316 (Refine), suivi par le AC222, 293 + ester de MPCA et le ICIA 0604 + ester de MPCA + S.O.C.

INTRODUCTION: Wild oats remain one of the most serious weed problems in Western Canada. Virtually every hectare of land planted to cereal and oilseed crops is treated with a wild oat herbicide (Banting 1983). Losses from wild oats, such as yield reduction, cleaning costs, and lowering of grade quality are well recognized. Studies on the effect of different wild oat densities in wheat indicate that two wild oat plants per square foot can cause a yield loss of 15 percent (Banting, 1982). Poor broadleaf and perennial grass weed control can further reduce these yields.

Presently approximately 3000 acres of grain in the St. Quentin area of Restigouche County are infested. We must prevent the spread of this weed to other areas of New Brunswick and keep its densities to a manageable and controllable level. A herbicide trial was therefore established to evaluate various registered and non-registered products. These herbicides were applied either alone or in a tank mix with a broadleaf weed herbicide for their effectiveness in controlling wild oats and broadleaf weeds with no associated crop damage.

MATERIALS AND METHODS:

Leger barley was planted at a seeding rate of 140 kg/ha and at a row width of 15 cm, May 26, 1989 in St. Quentin, Restigouche County. The soil was a silt loam with a pH of 7.2 and organic matter content of 4.6%. 364 kg/ha of 12-24-24 fertilizer was applied. Experimental design was randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was barley. Post emergence (Post) herbicides (see table 1) were applied June 9, 1989 at the barley 2 leaf stage, wild oat 2-3

leaf stage and to 2.5 cm high broadleaf weeds. Herbicides were applied with a CO_2 backpack sprayer in a water volume of 150L/ha at a pressure of 207 kPa. Rainfall was 13.7 mm five days prior to application and 34.2 mm ten days after. Visual ratings on crop phytotoxicity and weed control were collected June 22, July 7 and August 7. No yields or final wild oat counts were available due to farmer error. Analysis of variance was performed on the visual ratings and means separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

CROP TOLERANCE

Based upon crop stunting, the three most phytotoxic treatments, throughout the rating periods were HOE 6001-02H, HOE 6001-02H
+ DPX M6316 (REFINE) and diclofop methyl + DPX-M6316 (see Table 1). By the final rating (73 days after treatment) these treatments had 27.5%, 13.0% and 10% crop injury respectively, and were the only treatments significantly different than the control. The remaining treatments had only slight injury ranging from 0% to 5%. Effect of herbicides on yields could not be determined due to farmer error.

WEED CONTROL: All treatments significantly controlled wild oats during all rating periods. Treatments controlling over 90% wild oats and not significantly different from one another were: AC 222,293 (92.5%); Hoe 6001-02H+ 2,4-D (91.3%); ICIA 0604 + Bromoxynil/MCPA + S.O.C. (91.3%); diclofop methyl + DPX-M6316 (90.0%) and AC 222,293 + MCPA ester (90.0%). The remaining treatments controlled wild oats from 41.3% to 88.7% (see table 1).

Best overall wild oat and broadleaf weed control was obtained from the diclofop methyl + DPX-M6316 tank mix, followed by AC222, 293 + MCPA ester and ICIA 0604 + MCPA ester + S.O.C.

CONCLUSIONS: All treatments significantly controlled wild oats as compared to the untreated control. The best treatments resulting in over 90% wild oat control and not significantly different from one another included AC222, 293, ICIA 0604 + bromoxynil/MCPA, HOE 6001-02H + 2,4-D, diclofop methyl + DPX-M6316 and AC222, 293 + MCPA ester respectively. These treatments all had less than 10% crop damage in the form of stunting and would unlikely significantly reduce yields. The best tank mix in terms of wild oat and broadleaf weed control was diclofop methyl + DPX-M6316 (REFINE). This was the treatment that most growers in the St. Quentin area applied this year. Other promising treatments included AC222, 293 + MCPA

ester and ICIA 0604 + MCPA ester + S.O.C. The two most phytotoxic treatments were HOE 6001-02H and HOE 6001-02H + DPX M6316. Yields were unavailable so it is not known whether these treatments would have significantly reduced yields. Only three treatments had phytotoxic levels significantly higher than the untreated control.

Acknowledgements: Appreciation is expressed to Richard Roy for providing land for this trial.

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TABLE 1. Yields and Visual Ratings (August 7, 1989)

TREATMENT	RATE kg(a.i.)/ha	Crop Damage	% W.O. Control	% BLW Control
Control	-	0 e	0 e	12.5f
Hoe 6001-02H	0.09 +	27.5a	86.3a	38.7cde
Hoe 6001-02H+2,4-D	0.09 + 0.14	3.0 dc	91.3a	38.7cde
Hoe 6001-02H+DPX-M6316	0.09 + 0.015	13.0b	88.8a	71.2abc
Hoe 046360 + MCPA AMINE	0.09 + 0.42	1.0 de	41.3d	66.2abcd
Hoe 046360 + MCPA + 2,4-D	0.09 + 0.42 + 0.14	0 e	78.8ab	66.2abcd
Hoe 046360 + dicamba/ MCPA	0.09 + 0.5	0 e	63.7bc	76.2ab
ICIA 0604 + MCPA ester + S.O.C.*	0.25 + 0.56 + 1% v/v	0 e	82.5ab	80.0a
ICIA 0604 + Bromoxynil/MCPA+S.O.C.*	0.25 + 0.56 + 1.0% v/v	0 e	91.3a	62.5abcd
ICIA 0604 + S.O.C.*	0.25 + 1.0% v/v	0 e	86.2a	42.5cde
Diclofop methyl	0.75	5.0 cde	86.2a	17.5ef
Diclofop methyl+ DPX M6316	0.75 + 0.015	10 bc	90.0a	88.7a
Diclofop methyl + Bromoxynil	0.75 + 0.28	0 e	85.0a	45.0bcde
Difenzoquat	0.75	5.0 cde	53.4cd	37.5de
Difenzoquat + bromo-xynil/MCPA	0.75 + 0.56	4.0 cde	80.0a	80.0a
AC222, 293	0.40	0 e	92.5a	62.5abcd
AC222, 293 + MCPA ester	0.40 + 0.56	0 e	90.0a	81.2a

*S.O.C. = Superior Oil Concentrate
W.O. = Wild oats
BLW = Broad leaf weeds

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's Multiple Range Test.

CROP TOLERANCE AND WEED CONTROL IN SWEET WHITE LUPINS

K. V. McCully, D.O. Hanscomb, M.A. Mann

ABSTRACT: A trial was conducted at Cornhill, N.B. to evaluate various herbicides for weed control and crop tolerance in Lupins. Visual assessments on weed control and crop tolerance were made throughout the summer and yields collected Oct. 13, 1989. Results indicated that lupins were tolerant to all herbicides tested throughout the evaluation period. The worst weed present at the trial site was quackgrass. Evaluation and comparison of weed control and yield data was difficult since most of the herbicides were selective towards broadleaf weeds and not quackgrass. Only two of the twelve treatments contained fluazifop-p-butyl, a quackgrass herbicide. Therefore as expected, these two treatments (linuron (pre) + fluazifop-p-butyl (post) and metobromuron (pre) + fluazifop-p-butyl (post)) resulted in the highest % weed control. With the exception of linuron + fluazifop-p-butyl, there did not appear to be any clear trends or strong relationships between % weed control, % crop damage and yields. This could be explained by the uneven quackgrass distribution throughout the plots. Overall the best treatment was the linuron + fluazifop-p-butyl treatment which resulted in the highest yield and the second best % weed control.

TOLÉRANCE DES PLANTES ET SUPPRESSION DES MAUVAISES HERBES DANS LES CULTURES DE LUPINS BLANCS DOUX

Résumé: Un essai a été réalisé à Cornhill (N.-B.) afin d'évaluer divers produits servant à supprimer les mauvaises herbes dans les cultures de lupins ainsi que la tolérance des lupins à ces herbicides. Des évaluations visuelles relatives à la suppression des mauvaises herbes et à la tolérance des plantes ont eu lieu durant l'été, et les données sur le rendement ont été notées le 13 octobre 1989. Les résultats indiquent que les lupins tolèrent tous les herbicides appliqués durant la période d'évaluation. La plante adventice la plus nombreuse dans le champ d'essai était le chiendent. Il a été difficile de faire l'évaluation et la comparaison des données sur l'efficacité des herbicides et le rendement, car la plupart des herbicides agissaient sélectivement sur les mauvaises herbes à larges feuilles et non sur le chiendent. Seulement deux des douze traitements contenaient du fluazifop-p-butyl, un destructeur de chiendent. Par conséquent, comme on s'y attendait, ces deux traitements [linuron (prélevée) + fluazifop-p-butyl (postlevée) et métobromuron (prélevée) + fluazifop-p-butyl (postlevée)] ont détruit un plus grand pourcentage de mauvaises herbes. Sauf dans le cas du mélange linuron + fluazifop-p-butyl, il ne semble pas y avoir de tendances définies ou de rapports étroits entre le pourcentage de plantes détruites, le pourcentage de plantes endommagées et le rendement. Ce fait peut être expliqué par la répartition inégale du chiendent sur les parcelles. En général, on peut en déduire que le meilleur traitement est l'application de linuron + fluazifop-p-butyl: il se classait premier pour le rendement et deuxième pour la proportion de mauvaises herbes détruites.

INTRODUCTION: Lupins are an annual legume or pulse crop which are currently being evaluated in New Brunswick as a high protein, high fibre and low oil crop. Lupins are a relatively poor competitor with weeds. Presently there are no herbicides registered for weed control in lupins making weeds one of the major limiting factors in Lupin production. Poor weed control can result in reduced yields through competition and also interfere with harvesting. A minor use submission has been made to obtain registered herbicides for weed control in lupins. A trial was therefore established to generate and support data necessary for the registration process and to evaluate the herbicides being considered for registration in lupins.

MATERIALS & METHODS: The trial was established in Cornhill, Sussex, Kings County in a silt loam soil having a pH of 6.8 and an organic matter content of 3.0%. "Ultra" Sweet White Lupins were planted on May 12, 1989

at a seeding rate of 202 kg/ha. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was oats. Preemergence (PRE) herbicides (see table 1) were applied May 15. Post emergence (Post) herbicides (see table 1) were applied June 13 when the crop was 15cm high and the quackgrass was in the 3-4 leaf stage. They were applied using a CO_2 backpack sprayer in a water volume of 300 L/ha at a pressure of 200 kPa. Rainfall was 9 mm five days prior to pre-applications and 92.0 mm ten days after. Rainfall levels 5 days before post applications were 27.6 mm and 19.2 mm ten days after. Visual assessments on crop phytotoxicity and weed control were taken June 13, June 29, July 13 and August 10, 1989. Yields were collected October 13 and stored to dry at 10-20^0.

Analysis of variance and logarithmic transformations were performed on the visual evaluations and yields. Means were separated by Duncan's Multiple Range Test.

RESULTS & DISCUSSION

Crop Damage

Metribuzin (0.75 kg(a.i.)/ha) was the only treatment resulting in significant crop injury as compared to the control by the June 29 rating date (45 days after pre-applications) (see Table 1). Other treatments resulting in crop injury over 5% but not significantly different from the control included linuron + fluazifop-p-butyl (8.8%), metribuzin (0.50 kg(a.i.)/ha) (6.3%) and metobromuron + metolachlor (5.0%). However, by the final evaluation date (Aug.10) all treated plots recovered with no herbicide injury evident.

Weed Control

Although weed control was evident from a number of treatments by the first rating date (June 13 - 29 days after application) no significant differences existed between any of the treatments or the control. By the second rating date (June 29 - 45 days after pre application; 16 days after post applications) six treatments resulted in significant weed control as compared to the untreated plots. These included linuron (pre) + fluazifop-p-butyl (post) (72.5%); metobromuron (pre) + fluazifop-p-butyl (post)(62.5%); metribuzin (0.50 kg(a.i)/ha)(30%); metribuzin (1.0 kg(a.i.)/ha) (27.5%); metribuzin (0.75 kg (a.i.)/ha) (26.4%) and linuron (1.5 kg (a.i.)/ha) (21.3%). One of the worst weeds at the trial site was quackgrass, so it was understandable that treatments containing the grass herbicide, fluazifop-p-butyl, resulted in the highest percent weed control.

By the last rating date (August 10) there were still six treatments, resulting in significantly higher weed control than the untreated plots (see Table 1). Of these

TABLE 1: Visual Evaluations and Yields (16% Moisture)

	TREATMENTS	TIMING	RATE (kg(a.i) /ha)	% CROP Damage June 29	% CROP Damage Aug. 10	% WEED CONTROL 08-10*	YIELDS 16% moist. g/m^2
1	metribuzin	pre	0.50	6.3ab	0NS	21.3bc	283 b
2	metribuzin	pre	0.75	11.3a	0	5.0d	317 b
3	metribuzin	pre	1.00	3.8ab	0	32.5ab	311 b
4	Linuron	pre	1.00	2.5ab	0	15.0cd	337 b
5	Linuron	pre	1.50	0b	0	46.3ab	383ab
6	metobromuron	pre	1.00	1.3b	0	2.5d	318 b
7	metobromuron	pre	1.50	0b	0	8.8cd	350ab
8	chloramben	pre	3.00	2.5ab	0	0.0d	297 b
9	metobromuron	pre	1.60	5.0ab	0	21.3bc	339 b
	b) metolachlor	pre	2.40				
10	metobromuron	pre	1.60	3.8ab	0	63.8a	377ab
	b) fluazifop-p-butyl	post	0.25				
11	linuron	pre	1.00	8.8ab	0	61.3a	459a
	b) fluazifop-p-butyl	post	0.25				
12	Control	-	-	0b	0	0.0d	292b

*Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's Multiple Range Test.

only metobromuron (pre) + fluazifop-p-butyl (post) (63.8%) and linuron (pre) + fluazifop-p-butyl (post) (61.3%) resulted in weed control over 60%. The remaining four treatments significantly controlled weeds between 21.3% and 46.3%.

Although the linuron (pre) + fluazifop-p-butyl (post) treatment resulted in 61.3% weed control by the final rating, it was not significantly better than the high rate of linuron (1.5 kg(a.i.)/ha) (46.3%) applied alone. Also the high rate of metribuzin (1.0 kg (a.i.)/ha) although controlling a higher percentage of weeds (32.5%) than the lower metribuzin rate (0.5 kg(a.i./ha) (12.3%), they were not significantly different. For reasons not understood the metribuzin 0.75 kg(a.i.)/ha rate resulted in significantly less weed control than the lower 0.5 kg(a.i.)/ha rate. Metobromuron applied alone, the low rate of linuron and the chloramben treatment all resulted in poor and unacceptable weed control by the final rating period date.

Yields

Yields were converted to a common percent moisture level of 16%. Results indicated that although most treatments resulted in yield increases as compared to the control, only linuron (pre) + fluazifop-p-butyl (post) resulted in a significantly higher yields (see Table 1). The second highest yielding treatment, however not significantly different from the control was surprisingly linuron (1.5 kg (a.i.)/ha). It is possible that these plots may have had lower initial quackgrass densities than the other treatments in addition to good broadleaf weed control. This may have resulted in relatively weed free plots at the critical time and hence higher yields. Although not significantly higher than the control, the next highest yielding treatment was metobromuron (pre) + fluazifop-p-butyl (post). This treatment was expected to give yields significantlly higher than the untreated control since fluazifop-p-butyl was included to control quackgrass. It is possible that quackgrass densities were initially low and any extra quackgrass control resulting from fluazifop-p-butyl was not enough to increase yields significantly. The yield data also indicated that metobromuron applied alone was almost as effective as the metobromuron followed later with fluazifop-p-butyl treatment. This further leads one to believe that initial quackgrass densities must have been low in the metobromuron + fluazifop-p-butyl treated plots.

CONCLUSIONS: Lupins were tolerant to all herbicides tested with no crop damage being observed by the August 10 evaluation date. Quackgrass was one of the worst

weeds identified in plots and was present at various densities. This made evaluation and comparisons on weed control and crop yields difficult, since most of the treatments included in the trial were targeted towards broadleaf weeds. For example, some of the treatments may have provided excellent control of broadleaf weeds but poor quackgrass control. As a result overall control ratings appear low for treatments not controlling both broadleaf weeds and quackgrass.

By the final rating date (August 10) six treatments resulted in significant weed control as compared to the untreated plots. As expected best overall weed control resulted from the treatments containing the grass herbicide fluazifop-p-butyl. These included metobromuron followed with fluazifop-p-butyl (63.8%) and linuron followed with fluazifop-p-butyl (61.3%). The remaining four treatments significantly controlled weeds between 21.3% and 46.3%. Overall weed control was lower for all treatments not containing fluazifop-p-butyl because quackgrass was present in these plots and at various densities. This made overall weed control ratings variable and difficult to compare.

Only one treatment (linuron + fluazifop-p-butyl) resulted in yields significantly higher than the control. Other high yielding treatments, although not significantly higher than the control included linuron (1.5 kg(a.i.)/ha) and metobromuron + fluazifop-p-butyl.

The best overall treatment in terms of weed control and lupin yield was linuron (pre) + fluazifop-p-butyl (post). Other promising treatments included metoboromuron + fluazifop-p-butyl, linuron (1.5 kg(a.i.)/ha), metobromuron 1.5 kg(a.i.)/ha and metobromuron + metolachlor.

Most of the herbicides included in this trial were targeted and selective for broadleaf weeds and annual grass control. With quackgrass being the predominant weed, overall weed control ratings for most products was poor, although broadleaf weed control may have been excellent. If quackgrass had not been present treatment comparison would have been easier. As a result it was difficult to observe any clear trends between crop damage, weed control and yields with treatments not containing a quackgrass herbicide. Further research on weed control and yield comparisons should be conducted.

Acknowledgements. Appreciation is extended to Joerg Van Waldo for providing the trial site and to Roger Theriault for his assistance.

WEED CONTROL AND CROP TOLERANCE ON NEWLY PLANTED FIDDLEHEADS

K. V. McCully and D. O Hanscomb

ABSTRACT: A trail to evaluate crop tolerance and weed control on newly planted fiddleheads was conducted. A total of eight herbicide treatments applied either preplant incorporated (ppi) or pre-emergence were evaluated. Visual ratings on crop tolerance and weed control were collected in both the year of application and the year after application. The most promising treatments in the planting year included simazine (ppi) (7.5% crop damage, 81% weed control); EPTC (ppi) (0% crop damage and 65% weed control) and diphenamide (pre) (0% crop damage and 60% weed control). The most phytotoxic treatment was hexazinone. Results collected from evaluations on fiddlehead recovery and residual weed control the following year indicated that none of the treatments resulted in both acceptable residual weed control and acceptable crop damage levels.

SUPPRESSION DES MAUVAISES HERBES DANS LES CULTURES DE CROSSES DE FOUGÈRES RÉCEMMENT PLANTÉES ET TOLÉRANCE DES PLANTES AUX HERBICIDES

Résumé: Des essais ont été réalisés dans des cultures de crosses de fougères récemment plantées afin d'évaluer la tolérance des plantes et l'efficacité des herbicides. Un total de huit traitements ont été incorporés au sol avant la plantation ou appliqués en prélevée. Des évaluations visuelles relatives à la tolérance des plantes et à la suppression des mauvaises herbes ont été réalisées au cours de l'année de plantation et l'année suivant l'application. Les traitements les plus efficaces durant l'année de plantation sont le simazine incorporé au sol avant la plantation (7,5 % de plantes endommagées et 81 % des mauvaises herbes détruites), l'EPCT incorporé au sol avant la plantation (0 % de plantes endommagées et 65 % des mauvaises herbes détruites) et le diphénamide appliqué en prélevée (0 % de plantes endommagées et 60 % des mauvaises herbes détruites). Le traitement le plus phytotoxique était l'hexazinone. Les résultats recueillis lors des évaluations du rétablissement des plantes endommagées et des effets résiduels des herbicides l'année suivante indiquent qu'aucun des traitements ne donne satisfaction à ces égards.

INTRODUCTION: Cultivated fiddleheads are currently commercially grown on a very low acreage in New Brunswick. Presently there are no herbicides registered for this crop and their tolerance to a number of widely used herbicides is not known. If cultivated fiddleheads are to be grown commercially, weed control will be one of the most challenging and difficult components of the overall production plan. Herbicide screening trials must be conducted to gather information on the fiddleheads tolerance at various application timings and rates.

One of the most important times for weed control in perennial crops is in the planting or establishment year. In order to ensure a strong healthy competitive crop develops, you want the plant to grow with minimal weed interference or competition. If weeds compete with the slow growing cultivated fiddleheads, the time from planting to the time for commercial picking can be prolonged.

A trial was therefore established to evaluate weed control and crop tolerance from various preplant incorporated and preemergence herbicides on newly planted fiddleheads.

MATERIALS AND METHODS: A trial was established at the New Brunswick Horticulture centre, Hoyt, N.B. Fiddleheads were planted July 8, 1988 in a riverbank sandy loam soil having a pH of 5.2 and an organic matter level of 2.89%. Experimental design was a randomized complete block, replicated four times. Plot size was 2m X 5m. Preplant incorporated (PPI) herbicides (see table 1) were applied July 8, 1988 and the preemergence (PRE) herbicides July 26. Herbicides were applied with a CO_2 backpack sprayer in a water volume of 250 L/ha at a pressure of 200 kPa. Rainfall was 0.4 mm five days prior to first spray and 38.9 mm ten days after. At the second application, rainfall was 30.1 mm five days prior and 22.9 mm ten days after. A total of 600 kg per hectare of 15-15-15 fertilizer was applied to the plots. Visual ratings on weed control and crop phytotoxicity were taken August 19, September 2, October 21, 1988 and July 4, 1989. Analysis of variance was performed on the collected data and means separated by Duncan's multiple range test.

RESULTS:

CROP DAMAGE

The only treatments which were not significantly different from the untreated control during both rating dates (Aug. 19 and Sept. 2) were diphenamide, trifluralin, and EPTC. Chlorthal dimethyl was not significantly different from the untreated control during the August 19 rating date only. Simazine at the September 2 rating date had only 7.5% crop damage but was still significantly higher than the untreated control (see Table 1). With fall frosts the fiddleheads died back making later evaluations impossible.

The following summer fiddlehead recovery was evaluated. Although a number of the herbicides resulted in various degrees of phytotoxicity, only the hexazinone and chloroxuron treatment resulted in significant crop damage as compared to the control. The least phytotoxic herbicides (6.5% crop damage) at this time included trifluralin, chlorthal dimethyl and diphenamide. Some of the phytotoxicity observed at this time could also have been from winter damage.

WEED CONTROL

As compared to the control, all treatments resulted in significant weed control by the August 19 visual assessment date. Treatments resulting in over 90% weed control at this time included hexazinone (100%), chloroxuron (97.5%), EPTC + atrazine (95%) and simazine

(91.3%). By the next rating date (September 2) chlorthal dimethyl was the only treatment not providing significant weed control. The above treatments at this time resulted in control between 81.3% and 100% (See Table 1). By October 21, trifluralin and chlorthal dimethyl were the only treatments not providing significant weed control. Treatments resulting in over 85% weed control at this time included hexazinone (100%), chloroxuron (95%) and EPTC + Atrazine (85%). The remaining treatments resulted in control between 45% and 56.3%. Principal weeds identified within the plots included smartweed, narrowleaf goldenrod, sheep sorrel, daisy and corn spurrey. Of these, smartweed and narrow leaf goldenrod were the most abundant.

The following summer weed control was evaluated to give an indication of residual weed control expected. The most residual weed control resulted from hexazinone (92.5%) followed by EPTC + atrazine (37.5%). These were the only treatments resulting in significant weed control as compared to the untreated plots. Treatments giving the best smartweed control were hexazinone, diphenamide, EPTC + atrazine and simazine. The best goldenrod control resulted from the simazine and hexazinone treatments.

DISCUSSION AND CONCLUSIONS: During the year of application, treatments which resulted in excellent weed control (> 90%) but unacceptable crop damage (> 20 %) included EPTC + atrazine, hexazinone, and chloroxuron. The most promising treatments included the simazine preplant incorporated (ppi) (7.5% crop damage, 81.0% weed control), EPTC (ppi) (0 % crop damage, 65% weed control and diphenamide (0% crop damage, 60% weed control). The remaining treatments resulted in either unacceptable weed control or unacceptable crop phytotoxicity levels. The EPTC + atrazine treatment resulted in excellent weed control but the atrazine apparently caused the 20% crop damage since EPTC by itself had 0% crop damage. Possibly with lower rates of atrazine, crop damage could be reduced enough to make it an effective and viable treatment. Also if chloroxuron crop damage could be reduced by using lower rates and the same level of weed control could be achieved, it could also be an effective treatment.

Results collected from evaluations on crop damage recovery and residual weed control the following summer indicated that none of the treatments resulted in both residual weed control and acceptable crop damage recovery. Hexazinone for example had excellent residual weed control the following year (92.5%), but crop damage was much too high (62.5%) and unacceptable. None of the other treatments had acceptable weed control levels at this time. This indicated the importance and necessity

for further weed control methods the year after planting. More crop damage was observed the summer after application from a number of the treatments, but this could be attributed to winter damage and excessive weed pressure.

Smartweed and narrowleaf goldenrod were the most abundant weeds present in the plots. Smartweed was most effectively controlled with hexazinone, diphenamide, EPTC + atrazine and simazine. The best goldenrod control resulted form simazine and hexazinone treatments.

Further research to evaluate various herbicides and rates on fiddlehead crop tolerance and weed control must be conducted in order that an effective herbicide treatment can be selected for fiddleheads in the year of planting.

Acknowledgement - Appreciation is extended to the New Brunswick Horticulture Centre for providing the land and fiddleheads for the trial and to Cynthia Murray for her assistance in planting the fiddleheads.

TABLE 1. Visual Ratings of Crop Damage & Weed Control

TREATMENT	RATE kg(a.i.) /ha	TIMING	VISUAL RATINGS % CROP DAMAGE Sept.2/88	% WEED CONTROL Sept.2/88	% CROP DAMAGE July 89	% WEED CONTROL July 89
Control	-	-	0.0d	0.0f	0a	12.5cd
Trifluralin	1.1	PPI	0.0d	38.0de	6.5a	5.0cd
EPTC	3.8	PPI	0.0d	65.0bcd	19.5a	7.5cd
EPTC + Atrazine	3.8 1.3	PPI	20.0b	91.0ab	24.5a	37.5b
Simazine	1.6	PPI	7.5c	81.0abc	24.5a	15.0cd
Hexazinone	2.0	PRE	81.0a	100.0a	62.5b	92.5a
Chlorthal dimethyl	9.0	PRE	18.0b	18.0ef	6.5a	0d
Diphenamide	4.8	PRE	0.0d	60.0cd	6.5a	3.75cd
Chloroxuron	4.8	PRE	23.0b	96.0a	56.5b	22.5bc

QUACKGRASS CONTROL IN ESTABLISHED ALFALFA

K.V. McCully, D. O. Hanscomb and M.A. Mann

ABSTRACT: A trial to evaluate various registered and non-registered products on their effectiveness in controlling quackgrass with no crop damage was conducted. Visual ratings on crop damage and quackgrass control were collected in addition to quackgrass shoot densities, alfalfa yields, and botanical composition. No significant crop damage was observed 30 days after application from any treatment. Treatments containing R017-3664 + Renex 36, UBI 9076 + Assist, DPX-Y6202-31 and DPX-Y6202-23 appeared the most promising. Two of the best individual treatments in most rating categories was either R017-3664 + Renex 36 (0.10 kg(a.i.)/ha + 0.25% v/v) or UBI 9076 + Assist (0.090 kg(a.i.)/ha + 1% v/v). High quackgrass densities were found to greatly reduce the percent alfalfa found within each plot.

RÉPRESSION DU CHIENDENT DANS LES CHAMPS DE LUZERNE EN CULTURE

Résumé: Un essai a permis d'évaluer l'efficacité de divers produits homologués et non homologués contre le chiendent sans qu'ils occasionnent de dommages à la luzerne. On a fait une évaluation visuelle des dommages causés à la luzerne et du taux de suppression du chiendent, en plus de calculer la densité des pousses de chiendent et d'évaluer le rendement de la luzerne et la composition botanique du champ. Aucune altération importante de la luzerne n'a été observée 30 jours après l'application. Les traitements qui offrent les meilleures perspectives sont les produits renfermant du R017-3664 + Renex, du UBI 9076 + Assist, du DPX-Y6202-31 et du DPX-Y6202-28. Les deux meilleurs traitements individuels dans la plupart des doses appliquées sont le R017-3664 + Renex 36 (0,10 kg (i.a.)/ha + 0,25 % v/v) ou le UBI 9076 + Assist (0,090 kg (i.a.)/ha + 1 % v/v). On a constaté que la densité du chiendent réduit grandement la proportion de luzerne dans chaque parcelle.

INTRODUCTION: Quackgrass is a serious perennial weed of many crops, including alfalfa throughout New Brunswick. One plant can produce up to 300 feet of rhizomes and 200 shoots in a single season (Hay, 1962). Losses due to quackgrass in alfalfa are associated with establishment, stand longevity, quality, animal utilization and increased problems in rotational crops (Leroux, 1987). If quackgrass competes with the legume during the seedling year, you can expect a weaker, thinner and less productive stand. As a result it shortens the productive life of the stand and forces growers to renovate their fields earlier than when adequate control measures are applied. The quality of a forage may also be reduced and constitute a major source of loss as quackgrass lowers the nutritive value of harvested forages. With the increased emphasis on alfalfa production within New Brunswick, quackgrass will be one of the more serious weeds in terms of reducing stand longevity. A trial was therefore established as a follow up to a trial conducted last year (McCully, et.al., 1988) to evaluate various graminicides on their efficacy in controlling quackgrass.

MATERIALS AND METHODS:

The trial was established in Sussex, Kings County in a sandy loam soil having a pH of 7.2 and an organic matter content of 3.2%. O.A.C. Minto alfalfa was planted on May 20, 1987 at a seeding rate of 13.64 kg/ha. 340 kg/ha of

5-10-30 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was alfalfa. Herbicides (see Table 1) were applied May 30, 1989 when the alfalfa was 30-35 cm high and the quackgrass was in the 4-6 leaf stage. Herbicides were applied using a CO_2 back pack sprayer in a water volume of 250L/ha at a pressure of 200 kPa. Rainfall was 17.8 mm 5 days before application and 47.3 mm ten days after. Visual assessments on crop phytotoxicity and weed control were taken on June 13, June 29 and July 25, 1989. Harvests were taken on July 6 and August 28. Density counts were taken in $50cm^2$ quadrats, on June 5th, 5 days after treatment application to give an indication of the initial quackgrass densities. Density counts were taken again on August 28, just prior to the 2nd cut, to see if any quackgrass density reduction occurred. Analysis of variance was performed on the visual evaluations and densities, and yields were transformed using logs. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSIONS
CROP DAMAGE

When compared to the untreated control R017-3664 + Renex 36 (0.10 kg(a.i.)/ha + 0.25% v/v) was the only treatment resulting in significant alfalfa damage 14 days after application (See Table 1). By June 30 (30 days after application) no significant crop damage was observed from any of the treatments. Alfalfa was therefore very tolerant to all the herbicides evaluated.

QUACKGRASS CONTROL

All treatments significantly controlled quackgrass up until the first harvest. Following the first harvest quackgrass recovery and regrowth resulted from many treatments. Although by the July 25th rating date, control was reduced by many treatments only the two clethodim + C.O.C. treatments resulted in control not significantly different from the untreated plots (see Table 1). The clethodim treatments initially resulted in high and fast quackgrass knockdown, but regrowth levels were too high. Treatments containing UBI 9076 + Assist and R017-3664 + Renex 36 were the only treatments resulting in increased quackgrass control after the first harvest. These treatments may have translocated and killed buds more effectively than the other treatments. Based upon visual observations, the R017-3664 treatments appeared to be more effective in controlling quackgrass than the UBI 9076 treatments, but not significantly.

Although pre-treatment quackgrass density counts varied from plot to plot, only the UBI 9076 + Assist (0.105

kg(a.i)/ha + 1% v/v) plots had significantly lower densities than those found in the untreated control. This indicated that a relatively consistent quackgrass stand existed at the trial site. Just prior to the second harvest density counts were collected again to get an indication of treatment efficacy. At this time, all treatments except fluazifop-butyl + Agral 90 treatment had significantly lower densities than the untreated control plots.

Treatments resulting in quackgrass density reductions of over 80% included R017-3664 + Renex 36 (0.10 kg(a.i.)/ha + 0.25% v/v)(92%); DPX-Y6202-31 + Canplus 411 (87.4%); UBI 9076 + Assist (0.09 kg(a.i.)/ha + 1% v/v) (85.5%); and UBI 9076 + Assist (0.120 kg (a.i.)/ha) (81%). The remaining treatments resulted in density reductions of between 43.2% and 77.8%. There were no visual ratings taken when quackgrass densities were collected August 28, so these counts are very important in final treatment evaluations. In general, treatments containing R017-3664 + Renex 36, UBI 9076 + Assist, DPX-Y6202-31 or DPX-Y6202-23 resulted in the best quackgrass control.

Overall there did not appear to be any advantage of adding $AmSO_4$ to the sethoxydim + assist mix. There was very little difference between sethoxydim and fluazifop-butyl treatments. The fluazifop-p-butyl D.F. + S.O.C. treatment significantly reduced quackgrass densities more than the fluazifop butyl + Agral 90 treatment. Clethodim rates resulted in a fast quackgrass knockdown but regrowth following the first harvest was unacceptable. The low rate of R017-3664 + Renex 36 surprisingly appeared to be more effective than the high rate. There were not any significant differences between the UBI 9076 + Assist rates tested. DPX-Y6202-31 + Canplus 411 was more effective in reducing quackgrass densities than DPX-Y6202-23 + Canplus 411.

Crop Yields and Botanical Composition

When examining alfalfa yield data, it is important to remember that yields include alfalfa, grass and broadleaf weeds all combined. Although it is not necessarily undesirable to have a number of grasses or broadleaf weeds mixed in with alfalfa, the objective of this trial was to obtain as weed free alfalfa as possible. Therefore the highest yielding treatments are not necessarily the best since it does not contain pure alfalfa. In this trial the control had the lowest overall yields since quackgrass densities were high enough to smother out a lot of alfalfa. Only two treatments DPX-Y6202-31 + Canplus 411 and R017-3664 + Renex 36 (0.15 kg(a.i.)/ha + 0.25% v/v) resulted in yields significantly higher than the untreated control.

TABLE 1: Visual ratings, density counts, and botanical composition

TREATMENT	RATE kg(a.i.) /ha	% CROP DAMAGE 07-25	%QUACK GRASS CONTROL 07-25	QUACK DENSITY PRESPRAY COUNT M^{-2} 06-5	QUACK DENSITY PRE 2nd CUT M^{-2} 08-28	FORAGE/YIELDS T/HA 1st CUT 07-6	FORAGE/YIELDS T/HA 2nd CUT 08-28	BOTANICAL COMP. PRE 2nd CUT %ALF	BOTANICAL COMP. PRE 2nd CUT % QUACK	BOTANICAL COMP. PRE 2nd CUT % WEED
Control	-	0.0NS	0.0f	616abc	448a	14.2ab	7.49b	24.5	59.2	16.3
Sethoxydim + Assist + $AMSO_4$	0.5+2L +4L	0.0	33.0de	520bcd	116c	12.8b	8.77ab	53.4	31.1	15.9
Sethoxydim + Assist	0.8 + 4.0L	0.0	39.0de	664ab	164c	14.4ab	8.97ab	35.9	28.7	35.4
Clethodim + COC	0.15 +1% v/v	0.0	23.0ef	548abcd	300b	14.4ab	8.62ab	38.7	54.7	6.6
Clethodim + COC	0.18 + +1% v/v	0.0	21.0ef	432cd	124c	15.5ab	7.85ab	50.5	24.8	24.7
R017-3664 + Renex 36	0.10 + 0.25% v/v	0.0	76.0ab	552abcd	44c	15.1ab	8.49ab	75.3	10.4	14.3
R017-3664 + Renex 36	0.15 + 0.25% v/v	1.0	83.0a	616abc	160c	14.2ab	9.28a	48.5	34.6	16.9
UBI 9076 + + Assist	0.075 1% v/v	0.0	53.0bcd	616abc	112c	14.2ab	9.13ab	52.5	25.9	21.6
UBI 9076 + Assist	0.09 + 1% v/v	0.0	76.0ab	468bcd	68c	15.8a	8.51ab	80.6	16.7	2.7
UBI 9076 + + Assist	0.105 + 1% v/v	0.0	69.0abc	392d	96c	13.9ab	8.37ab	70.8	23.5	5.7
UBI 9076 + Assist	0.120 + 1% v/v	0.0	69.0abc	756a	144c	14.5ab	8.62ab	44.8	36.0	19.2
Fluazifop-p-butyl DF + S.O.C.	0.25 + 1% v/v	1.0	41.0cde	400cd	112c	13.1ab	8.46ab	58.4	26.5	15.1
Fluazifop-butyl + Agral 90	0.5 + 0.1% v/v	0.0	35.0de	620abc	352ab	15.2ab	8.46ab	29.7	62.2	8.1
DPX-Y6202-23+ Canplus 411	0.144 + 1% v/v	2.0	48.0cde	576abcd	128c	15.5ab	8.23ab	48.2	37.5	14.3
DPX-Y6202-31 + Canplus 411	0.072 + 1% v/v	0.0	46.0cde	604abc	76c	14.8ab	9.31a	66.1	19.3	14.6

**means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's Multiple Range Test.

COC - Crop Oil Concentrate
SOC - Superior oil Concentrate

To give a better indication of plot yields, botanical compositions were determined. It must be remembered however that botanical compositions do not necessarily give a breakdown of the yields by weight since it is based on counts. For example there may be only 30% broadleaf weeds but they could weigh more than the 70% alfalfa. However, in this trial, the botanical composition, although based on counts, is felt to be an accurate percentage breakdown of the yields. When this is considered the highest yielding pure alfalfa treatment resulted from the UBI 9076 + Assist (0.090 kg(a.i.)/ha + 1% v/v) (8.51 T/ha X 80.6% alfalfa = 6.85 T/ha pure alfalfa) followed by DPXY-6202-31 + Canplus 411. These treatments also had the lowest quackgrass shoot densities. Generally, the treatments with the highest percent alfalfa had the lowest associated quackgrass shoot densities and % quackgrass in each plot.

CONCLUSIONS:

Alfalfa was very tolerant to all herbicides tested. Only R017-3664 + Renex 36 (0.01 kg(a.i.)/ha + 0.25 % v/v) resulted in significant crop damage 14 days after application. No significant crop damage was observed from any of the treatments 30 days after application.

All treatments significantly controlled quackgrass up until the first harvest on July 6. After this time, the only treatments to result in increased quackgrass control were treatments containing UBI 9076 + Assist and R017-3664 + Renex 36. The only treatments which were not significantly different from the control however, were the two clethodim treatments.

All treatments except fluazifop-butyl + Agral 90 significantly reduced quackgrass densities as compared to the control. In general, treatments containing R017-3664 + Renex 36, UBI 9076 + Assist, DPX-Y6202-31 or DPX-Y6202-23 resulted in the lowest quackgrass densities and best control.

Treatments with the highest percent alfalfa from the botanical composition breakdown generally had the lowest associated quackgrass shoot density and % quackgrass in each plot. UBI 9076 + Assist (0.090 kg(a.i.)/ha + 1% v/v) and DPX-Y6202-31 + Canplus 411 resulted in the highest percentage of pure alfalfa when the total yields were multiplied with the percent alfalfa from the botanical composition. These results indicate that quackgrass is very competitive and can reduce alfalfa yields. Stand longevity would likely decrease as well.

Overall, based on visual observations and density data, treatments containing R017-3664 + Renex 36 followed by

UBI 9076 + Assist, DPX-Y6202-31 and DPX-Y6202-23 appear the most promising. There appeared to be little difference between the fluazifop butyl and sethoxydim treatments, but control was less than the above mentioned treatments. Control from clethodim was unacceptable as regrowth after the first harvest was too high. Two of the best individual treatments in most rating categories was either R017-3664 + Renex 36 (0.10 kg(a.i.)/ha + 0.25% v/V) or UBI 9076 + Assist (0.090 kg(a.i)/ha + 1% v/v)

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ALTERNATIVES TO DINOSEB FOR WEED CONTROL IN SNAP BEANS

K.V. McCully, D.O. Hanscomb, M.A. Mann, and John Walsh

ABSTRACT: A trial to evaluate various herbicides as alternatives to dinoseb was established. Preplant incorporated, pre-emergence and post emergence herbicides applied either alone, in a tank m'x or applied sequentially were evaluated. Visual ratings on crop damage and individual weed species control was collected. In addition yields and crop maturity ratings were collected and evaluated. Results indicated that initial damage was observed 14 days after herbicide application from a number of treatments. By harvest however, the only treatments with significant crop damage and yield reduction as compared to the control and standard dinoseb was 40885 and 40885 + trifluralin. Weed control was often improved with many treatments as compared to dinoseb but never significantly. Some of the more promising treatments included trifluralin + bentazon + assist, clomazone + trifluralin, trifluralin + metrobromuron and eptc.

SUBSTITUT DU DINOSÈBE POUR SUPPRIMER LES MAUVAISES HERBES DANS LES CULTURES DE HARICOTS MANGE-TOUT

Résumé: Un essai a été réalisé dans le but d'évaluer l'aptitude de divers herbicides à remplacer le dinosèbe. On a évalué des herbicides incorporés au sol avant la plantation et des herbicides de prélevée et de postlevée; ils ont été appliqués seuls, dans un mélange ou en application séquentielle. On a procédé à l'évaluation visuelle des dommages causés aux haricots mange-tout et noté les espèces de mauvaises herbes qui ont été détruites. On a aussi recueilli et analysé des données sur le rendement et sur la maturation de la récolte. Les résultats indiquent que certains traitements ont causé des dommages qui ont été observés 14 jours après l'application du produit. Toutefois, au moment de la récolte, on a constaté que les applications de 40885 et de 40885 + trifluraline ont été les seuls traitements qui ont causé aux haricots des dommages durables et des réductions de rendement plus importants que ceux constatés chez les haricots non traités et sur ceux traités avec du dinosèbe. Certains traitements étaient plus efficaces que le dinosèbe, mais la différence n'était jamais considérable. Les traitements les plus prometteurs sont les suivants: trifluraline + bentazone + assist, clomazone + trifluraline, trifluraline + métrobromuron, et EPTC.

INTRODUCTION: Currently there are approximately 300 acres of processing beans grown in New Brunswick as well as a number of acres for the fresh market. The most commonly used and most effective herbicide used over the years has been dinoseb. However in 1986 dinoseb amine formulations were suspended after nitrosamine contamination was verified. This immediately stopped the formulation, sale and distribution of the product in Canada. Dinoseb oil base emulsifiable concentrates are however still registered but Health and Welfare has advised that margins of safety, even with protective clothing are low enough to expose applicators to an appreciable health risk. As a result, the emulsifiable concentrate formulation is going through a review process which may result in its suspension as well.

In beans grown for processing, weed free fields are essential. Fields heavily contaminated with weeds may even be by-passed. The possible suspension of dinoseb is an acute concern for bean growers, and if lost, an alternative herbicide must be found. A trial was therefore initiated to evaluate various pre-plant

incorporated, pre-emergent and post-emergent herbicides applied either alone or in a tank mix for weed control and crop tolerance.

MATERIALS AND METHODS: 'Gold Rush' beans were planted June 14, 1989 in a trial at Florenceville, Carleton County. The soil type was loam having a pH of 5.7 and an organic matter content of 3.1%. The seeding rate was 23 seeds a metre and in-row spacing was 76 cm. 392 kg/ha of 8-16-16 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was potatoes. Pre-plant incorporated (PPI) and preemergence (PRE) herbicides (see Table 1) were applied June 14. PPI herbicides were incorporated with a roto-tiller to a depth of 7.5 cm. Post-emergence (POST) herbicides (see Table 1) were applied June 30 at the 2-3 bean leaf stage; weeds were approximately 2 cm high. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 200 L/ha for PPI and 250 L/ha for PRE and POST herbicides. Sprayer pressure was 200 kPa. Rainfall was 4.8mm five days before the PPI and PRE applications and 13.6mm ten days after. Rainfall levels 5 days before POST applications were 9.4mm and 5.2mm ten days after. Visual assessments on crop phytotoxicity and individual weed species control were taken June 30, July 14, and August 14. Harvest was August 21 and bean maturity was evaluated over one replicate. Analysis of variance was performed on the visual ratings, and yield data was transformed using logs. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION: Crop Tolerance: Fourteen days after application of the pre-plant incorporated herbicides, 6 treatments resulted in crop damage significantly higher than the untreated control and the standard dinoseb treatment (see Table 1). These treatments included 40885 applied either alone (80%) or mixed with trifluralin (57.5%), and clomazone applied either alone (37.5%) or mixed with trifluralin (37.6%) or ethalfluralin (22.5%), and ethalfluralin applied alone (10%). Treatments containing 40885 resulted in very distinct veinal chlorosis while treatments containing clomazone resulted in a white bleaching of many leaves. Treatments containing clomazone recovered within 30 days of application to levels not significantly different from the control. The tank mixes containing clomazone resulted in less crop damage than if applied alone.

The post emergent treatment of bentazon + assist applied by itself (23.8%) resulted in crop damage significantly higher than the control and dinoseb treatments 14 days after post applications. As compared to the control, significant crop damage was also observed when it was

applied to plots previously treated with trifluralin (13.8%), but not when compared to dinoseb. However, by the final rating period (61 days after PPI application; 45 days after post applications) the only treatments displaying significant crop damage were 40885 applied alone and 40885 + trifluralin. These treatments resulted in the complete destruction of approximately 3 out of every 4 plants. Clomazone applied alone resulted in some bean plant stunting but damage was not significantly different from the untreated control or dinoseb treated plots.

Evaluation of yields indicated that the only two treatments which had significantly lower yields than the untreated control were 40885 and 40885 + trifluralin. All other treatments, except ethalfluralin, resulted in yields higher than the untreated control. None of these treatments, however were significantly different from one another or the control. EPTC was the highest yielding treatment followed by monolinuron, dinoseb, clomazone, lactofen and metobromuron.

Bean maturity ratings were collected from one replicate, making conclusive statements about the maturity ratings difficult. However, only slight differences were observed between treatments. The majority of treatments appeared to increase bean maturity as compared to the control. Some of the larger increases in maturity resulted from 40885 + trifluralin which had only a few surviving plants in each plot. This reduced competition and permitted faster growth and maturity. Lactofen as well increased maturity as did the trifluralin + bentazon + assist treatment. The former was also one of the best weed control treatments, which may have contributed to increased bean maturity, since less competition would have resulted.

Weed Control: A number of weed species were found within each replicate, but not always consistently within each plot. Four weeds which were relatively consistent from plot to plot were cudweed, lamb's quarters, lady's thumb and barnyard grass. Control of each of these weeds was evaluated separately for the herbicides (see Table 1).

Cudweed was significantly controlled as compared to the untreated control plots from 70 to 100% by 14 of the tested herbicide treatments (see Table 1). Treatments providing over 90% control included EPTC (100%); trifluralin + bentazon + assist (100%); bentazon + assist (100%); 53482 (100%); monolinuron (100%); lactofen (100%); metobromuron (90%); and trifluralin + metobromuron (90%). Although a number of treatments resulted in cudweed control lower than the standard dinoseb (75%), only AC 263,499, trifluralin, chloramben

TABLE 1: VISUAL RATINGS, MATURITY AND YIELDS

Treatment	Rates Kg(a.i.)/ha	Timing	Visual Ratings % Crop damage 14 days after application	Aug. 11	% Weed Control (08-11-89) CW	LQ	LT	BYG	Yields t/ha	Maturity** Rating
1. Control	0.0	ppi	0.0 g	0.0 b	0.0 d	0.0 d	0.0 c	0.0 bc	8.24 a	100
*2. Trifluralin	1.100	ppi	7.5 efg	0.0 b	20.0 cd	50.0 abcd	0.0 c	67.5 abc	8.79 a	102
*3. EPTC	3.900	ppi	0.0 g	0.0 b	100.0 a	87.5 a	67.5 ab	52.5 abc	10.62 a	107
*4. Ethalfluralin	1.100	ppi	10.0 ef	15.0 b	50.0 abcd	80.0 ab	20.0 bc	100.0 abc	7.63 a	102
*5. Trifluralin + Metobromuron	1.1+1.0	ppi	7.5 efg	0.0 b	90.0 a	97.5 a	27.5 bc	92.5 a	8.27 a	108
*6. Trifluralin + Chloramben	1.1+2.2	ppi	6.3 efg	0.0 b	32.5 bcd	57.5 abcd	57.5 abc	75.0 ab	9.67 a	108
7. Clomazone	0.750	ppi	37.5 c	26.3 b	75.0 ab	75.0 ab	75.0 ab	57.5 ab	10.30 a	100
8. Clomazone + Trifluralin	0.5+0.85	ppi	37.6 c	0.0 b	75.0 ab	92.5 a	55.0 abc	100.0 abc	9.77 a	108
9. Clomazone + Ethalfluralin	0.5+0.85	ppi	22.5 d	0.0 b	75.0 ab	75.0 ab	70.0 ab	72.5 a	8.68 a	103
10. 40885	0.800	ppi	80.0 a	73.5 a	70.0 abc	85.0 a	50.0 abc	35.0 ab	0.68 b	0
11. 40885 + Trifluralin	0.8+0.6	ppi	57.5 b	78.3 a	75.0 ab	100.0 a	50.0 abc	80.0 abc	0.79 b	117
*12. Trifluralin + Bentazon + Assist	1.1+1.1+ 2.0 L/ha	ppi/post	13.8 e	0.0 b	100.0 a	100.0 a	100.0 a	75.0 ab	9.05 a	113
13. Lactofen	0.200	pre	2.5 fg	0.0 b	100.0 a	20.0 bcd	25.0 bc	35.0 abc	9.92 a	117
14. 53482	0.075	pre	5.6 efg	0.0 b	87.5 a	70.0 ab	0.0 c	25.0 bc	9.15 a	101
15. AC 263,499	0.100	pre	4.4 fg	0.0 b	0.0 d	60.0 abc	95.0 ab	0.0 c	9.24 a	107
*16. Chloramben	2.600	pre	7.5 efg	0.0 b	20.0 cd	50.0 abcd	77.5 ab	50.0 abc	9.05 a	102
*17. Metobromuron	1.000	pre	0.0 g	0.0 b	90.0 a	57.5 abcd	0.0 c	0.0 c	9.83 a	107
*18. Dinoseb	3.670	pre	6.3 efg	0.0 b	75.0 ab	75.0 ab	75.0 ab	50.0 abc	10.12 a	107
*19. Monolinuron	1.250	pre	2.5 fg	0.0 b	100.0 a	5.0 cd	0.0 c	75.0 ab	10.23 a	94
*20. Bentazon + Assist	1.1+2.0 L/ha	post	23.8 d	2.5 b	100.0 a	67.5 ab	80.0 ab	25.0 bc	8.26 a	100

* = Treatments presently registered.

** = based on one replicate

CW = Cudweed, LQ = Lamb's Quarters, BYG = Barnyard Grass, LT = Lady's Thumb

Means with the same letter are not significantly different at the 0.05 level of signficance according to Duncan's Multiple Range Test.

and the untreated control plots resulted in control significantly lower. All remaining treatments controlled cudweed at levels not significantly different from dinoseb.

Lamb's quarters was significantly controlled as compared to the untreated control plots, from 65% to 100%, by 13 of the tested herbicide treatments (see Table 1). Treatments providing over 90% control included: 40885 + trifluralin (100%), trifluralin + bentazon + assist (100%), trifluralin + metobromuron (97.5%), and clomazone + trifluralin (92.5%). In comparison to the standard dinoseb treatment (75%), the only treatments resulting in significantly lower control were monolinuron and the untreated plots. Although varying, all other treatments were not signif- icantly different from dinoseb.

Lady's thumb was significantly controlled, as compared to the untreated control plots, from 67.5% to 100%, by 8 of the tested herbicide treatments (see Table 1). Treatments providing over 75% control included: trifluralin + bentazon + assist (100%), bentazon + assist (80%), chloramben (77.5%), AC 263,499 (75%), dinoseb (75%), and clomazone (75%). Although a number of treatments resulted in control lower than that of dinoseb, only trifluralin, metobromuron, 53482, monolinuron and the untreated control, were significantly lower. Although varying, all other treatments, were not significantly different from the standard dinoseb.

Barnyard grass was significantly controlled as compared to the untreated control plots, by only two treatments, clomazone + trifluralin (100%) and ethalfluralin (100%). All other treatments, although varying from 25% to 92.5% control, were not significantly different from the control. A high degree of variation between plots of the same treatment, over the four replicates, could explain this. None of the treatments resulted in significantly increased or decreased control than that achieved from the standard dinoseb treatment.

Overall, herbicide treatments providing the most effective weed control were trifluralin + bentazon + assist, clomazone + trifluralin, trifluralin + metobromuron, 40885 + trifluralin, and EPTC.

CONCLUSIONS: Significant crop damage was observed 14 days after treatment from 40885, 40885 + trifluralin, clomazone, clomazone + trifluralin, clomazone + ethalfluralin, ethalfluralin and treatments containing bentazon + assist. By harvest however, only treatments containing 40885 resulted in crop damage or yield reductions significantly lower than that of the untreated plots or standard dinoseb.

Weed control varied between herbicides depending upon the targeted weed. The only herbicides which resulted in significantly lower cudweed control than the standard dinoseb were trifluralin and chloramben. Treatments containing bentazon + assist provided the most effective control. Monolinuron was the only treatment which provided significantly less lamb's quarters control than the standard dinoseb. Trifluralin applied by itself or mixed with chloramben was not very effective, but when tank mixed or followed with a post emergent bentazon + assist spray resulted in excellent lamb's quarters control. Evaluation of lady's thumb control indicated that trifluralin, metobromuron and monolinuron provided significantly less lady's thumb control than the standard dinoseb. Treatments containing bentazon + assist provided the best lady's thumb control. None of the treatments resulted in significantly higher barnyard grass control than that obtained from dinoseb.

Overall, herbicide treatments providing the most effective weed control, with minimal crop damage, included trifluralin + bentazon + assist, clomazone + trifluralin, trifluralin + metobromuron, and EPTC. These treatments warrant further research as possible replacements for dinoseb. Treatments, providing poor weed control and need further evaluation before excluding them as possible dinoseb alternatives include trifluralin, chloramben, trifluralin + chloramben, monolinuron and metobromuron. Although weed control was poor with monolinuron and metobromuron by the final rating period, their yields were still high. It is possible that these herbicides may have provided enough weed control in the early weeks to prevent any reduction in yields.

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ALTERNATIVES TO DINOSEB FOR WEED CONTROL IN FIELD PEAS

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ABSTRACT: A herbicide screening trial involving 24 treatments with 14 herbicides applied either alone or in tank mixes was established to evaluate treatments as possible alternatives to dinoseb. Visual ratings on crop damage and weed control were collected. Yields and crop maturity ratings were also collected. Although initial crop damage resulted from a number of treatments, they all recovered by harvest. No significant differences existed between any treatment when evaluating crop damage or yields at this time. Pea maturity varied with treatments. Weed control was difficult to evaluate and compare since few weeds were present throughout the rating period. This resulted in no significant weed control as compared to the control. Further research must be conducted before a satisfactory alternative to dinoseb can be selected.

SUBSTITUTS DU DINOSÈBE POUR SUPPRIMER LES MAUVAISES HERBES DANS LES CULTURES DE POIS DES CHAMPS

Résumé: Un programme d'essais sélectifs d'herbicides comportant 24 traitements a été réalisé avec 14 produits herbicides appliqués seuls ou en mélange afin d'évaluer des substituts possibles du dinosèbe. On a procédé à l'évaluation visuelle des dommages causés à la culture et de la suppression des mauvaises herbes. On a également recueilli des données sur le rendement et sur la maturation des pois. Un certain nombre de traitements ont endommagé les jeunes plants, mais ils avaient tous récupéré au moment de la récolte. On n'a enregistré aucun écart important entre les traitements lors de l'évaluation des dommages et des rendements. Par contre, la maturité des pois variait en fonction des traitements. Il était difficile d'évaluer l'efficacité respective des traitements puisqu'il y avait peu de mauvaises herbes pendant la période d'évaluation. On ne constate donc pas de différence importante dans la suppression des mauvaises herbes sur les cultures soumises aux traitements et sur la culture témoin. Les recherches doivent se poursuivre pour trouver un substitut satisfaisant du dinosèbe.

INTRODUCTION: Currently there are approximately 4500 acres of processing peas grown in New Brunswick as well as a number of acres for the fresh market. The most commonly used and most effective herbicide used over the years has been dinoseb. However, in 1986, dinoseb amine formulations were suspended after nitrosamine contamination was verified. This immediately stopped the formulation, sale and distribution of the product in Canada. Dinoseb oil base emulsifiable concentrates are however, still registered but Health and Welfare has advised that margins of safety, even with protective clothing, are low enough to expose applicators to an appreciable health risk. As a result, the emulsifiable concentrate formulation is going through a review process which may result in its suspension as well.

In peas grown for processing, weed free fields are essential. Fields contaminated with weeds such as Canada Thistle or mustards may even be by-passed. The possible suspension of dinoseb is a deep concern for pea growers, and if lost an alternative herbicide must be found. A trial was therefore initiated to evaluate various pre-plant incorporated, preemergent and postemergent herbicides applied either alone or in a tank mix for weed control and crop tolerance.

MATERIALS AND METHODS: 'Bolero' peas were planted June

15, 1989 in a trial at Florenceville, Carleton County. The soil type was a loam with a pH of 6.6 and an organic matter level of 2.7%. Seeding rate was 23 seeds a metre and in row spacing was 18 cm. 336 kg/ha of 15-15-15 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m X 6m. Previous crop was beans. Preplant incorporated (PPI) herbicides (see table 1) were applied June 15 and incorporated 7.5 cm with a roto-tiller. Preemergence (Pre) herbicides (see table 1) were applied June 15. Postemergence (Post) herbicides (see table 1) were applied June 30 when the crop stage was 3-4 trifoliate and the weed growth stage was 2-3 cm. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 200 L/ha for PPI applications, and 250 L/ha for PRE and POST applications. Sprayer pressure was 200 kPa. Rainfall was 4.8 mm five days before the ppi and pre applications and 13.6 mm ten days after. Rainfall levels 5 days before POST applications were 9.4 mm and 5.2 mm ten days after. Visual assessments on crop phytotoxicity and weed control were taken June 30, July 14, and August 14. Harvest was August 14. Logarithmic transformations were performed on yields and visual ratings. Means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSION:

Crop Tolerance

Two weeks after ppi herbicide application (June 30) a number of treatments resulted in significant crop damage as compared to the untreated control and standard dinoseb. All treatments containing clomazone and 40885 applied either alone or in a mix, prometryne, ethalfluralin and 53482 resulted in significant damage (See Table 1). Clomazone damage was very distinguishable with a characteristic white bleaching of many pea leaves. The mix of clomazone and ethalfluralin was the most phytotoxic treatment with a rating of 37.5%. Clomazone applied by itself was significantly less toxic than the clomozone + ethalfluralin mix, but was significantly more toxic than the clomazone + trifluralin mix.

By July 14 (4 weeks after ppi application; 2 weeks after post application) many of the treatments started to recover. There were only five treatments with damage levels significantly higher than the control or dinoseb. These included all three 40885 treatments, AC 263,499 + Agral 90 + $AmSO_4$ and the clomazone + ethalfluralin treatment. The other clomazone treated peas recovered and appeared much healthier, while the treatments containing 40885 appeared to further weaken the peas.

By August 14 however, all treatments recovered from initial damage and no treatments were significantly different from the untreated control (see Table 1). Although yields varied between treatments, none of them were significantly different from each other. The highest yielding treatments included metribuzin (0.56 kg(a.i.)/ha) (4.77 T/ha); MCPB/MCPA (4.76 T/ha); 53482 (4.62 T/ha); bentazon + Assist (4.53 T/ha); MCPA amine (4.42 T/ha), and clomazone + trifluralin (4.42 T/ha). The lowest yielding treatments resulted from AC 263,499 + Agral 90 + $AmSO_4$ (2.66 T/ha). Maturity ratings were also collected but only from one replicate, making valid conclusions difficult. Treatments which appeared to delay maturity as compared to the control and dinoseb included 40885 (0.6 kg(a.i.)/ha); 40885 (0.8 kg(a.i.)/ha); MCPB/MCPA; MCPA amine; prometryne, ethalfluralin and treatments containing bentazon or BAS 351-40.

WEED CONTROL: Weed control was excellent with all treatments, including the control (see Table 1). As a result no significant differences existed between any treatments making weed control evaluations and comparisons difficult. It is probably that the late tillage and planting (June 15) controlled a couple of weed flushes. Warm soil temperatures and excellent growing conditions permitted fast pea germination and formation of a very thick crop canopy. This in turn smothered out many weeds. This may indicate that weed control in peas seeded later in the season may not be as critical as the earlier seeded peas. Pea varieties forming thick canopies quickly, could also be very beneficial in controlling weeds.

CONCLUSIONS:

Treatments displaying initial signs of crop injury included treatments containing 40885, clomazone and AC 263,499. Ethalfluralin, 53482, and prometryne applied alone also resulted in initial crop injury. By harvest however, peas had recovered with no significant differences in crop damage or yields. Weed control was excellent with all treatments including the control, possibly due to the late tillage and planting, fast pea germination and very thick crop canopy. Based upon crop tolerance, it appears that any of the treatments could be used as an alternative to dinoseb with no reduction in crop vigour or yields. With no weed control evaluations or comparisons possible, it is difficult to choose the best alternative to dinoseb. It appears that late seeding and a fast growing pea variety which forms

a thick canopy can be very beneficial in controlling weeds. Further research must be conducted before a satisfactory alternative to dinoseb can be selected.

ACKNOWLEDGEMENTS: Appreciation is exended to Barry Lewis and all other McCain's employees who assisted with this trial in some capacity.

TABLE 1 - Visual Ratings, Maturity and Yields

TREATMENT	RATE kg(a.i) /ha	TIMING	% CROP DAMAGE (14 days after application)	% CROP DAMAGE Aug. 14	MATURITY Rating	YIELDS (t/ha)*
Control -	PRE	0.0	0.0NS	99	4.02 N.S.	
Prometryne	2.0	PRE	16.2	0.0	86	4.28
Dinoseb	3.63	PRE	1.3	0.0	99	4.30
Metribuzin	0.42	PRE	1.3	1.3	92	4.28
Metribuzin	0.56	PRE	0.0	0.0	90	4.77
MCPA NA 300	0.375	POST	0.0	0.0	96	3.54
MCPA Amine	0.25	POST	0.0	0.0	85	4.42
MCPB/MCPA	1.4	POST	0.0	0.0	82	4.76
Trifluralin	1.04	PPI	8.8	0.0	93	4.27
Bas 351 40	1.08	POST	0.0	0.0	88	3.76
Bentazon + Assist	1.08+2.0L	POST	0.0	0.0	89	4.53
Bentazon+Citowett Plus	1.08+0.5%	POST	1.3	0.0	88	3.77
Clomazone	0.92	PPI	22.5	0.0	93	4.28
Clomazone + Trifluralin	0.61 + 1.04	PPI	10.0	0.0	100	4.42
Clomazone + ethafluralin	0.61 + 1.04	PPI	37.5	0.0	96	3.66
Lactofen	0.2	PRE	0.0	0.0	94	2.81
40885	0.6	PPI	17.6	0.0	82	3.80
40885	0.8	PPI	22.5	0.0	81	3.84
40885 + Trifluralin	0.98 + 0.74	PPI	16.2	0.0	106	3.94
53482	0.075	PRE	10.0	0.0	106	4.62
AC 263, 499	0.10	PPI	12.5	0.0	105	4.32
AC 263, 499	0.10	PRE	12.5	0.0	97	4.02
AC 263, 499 + Agral 90 + $AmSO_4$	0.1 + 0.25% +2.0L	POST	25.0	0.0	92	2.66
Ethalfluralin	0.85	PPI	16.2	0.0	89	3.11

*means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's Multiple Range Test.

BUNCHBERRY CONTROL IN BLUEBERRIES FROM FALL APPLIED HERBICIDES

K.V. McCully, D.O. Hanscomb, and S. LeBlanc

ABSTRACT: A herbicide screening trial to evaluate various fall applied herbicides, rates and tank mixes on bunchberry control in blueberries was conducted in 1987 at Stewarton, Queens Co., NB. Pre-treatment bunchberry density counts were collected from permanent quadrats in the fall of 1987 and compared to density counts collected September 7, 1988 and July 4, 1989. Visual ratings on crop damage and bunchberry control were also collected. Results indicated that only the high rate of sulfometuron methyl + Agral 90 (0.125 kg (a.i.)/ha + 0.25% V/V) resulted in significant crop damage by September 7, 1988. Visual results indicated four of thirteen treatments significantly controlled bunchberry (40-55%). Density count data collected in 1988 indicated that only five treatments actually reduced bunchberry densities (5.3%-36.8%). No reductions resulted by 1989. The best treatment based upon bunchberry densities was sulfometuron methyl + hexazinone + Agral 90 (0.150 + 3.0 kg (a.i.)/ha + 0.25% V/V). Although some control and density reduction occurred, control levels were still much too low and unacceptable. Further research needs to be conducted.

RÉPRESSION DES QUATRE-TEMPS DANS LES CULTURES DE BLEUETS AU MOYEN D'HERBICIDES APPLIQUÉS À L'AUTOMNE

Résumé: Un programme d'essais sélectifs d'herbicides a été réalisé en 1987 dans une bleuetière de Stewarton, comté de Queens (N.-B.), dans le but d'évaluer l'efficacité de divers herbicides contre les quatre-temps appliqués à l'automne, à diverses doses et en divers mélanges. On a calculé la densité des quatre-temps dans des quadrats permanents à l'automne de 1987, avant le traitement; l'opération a été répétée le 7 septembre 1988 et le 4 juillet 1989 afin de comparer les données recueillies. On a aussi fait l'évaluation visuelle des dommages causés aux bleuets et de la répression des quatre-temps. Les résultats indiquent que seule la forte dose de sulfométuron méthyl + Agral 90 (0,125 kg (i.a.)/ha + 0,25 % v/v) avait beaucoup endommagé les bleuets, selon l'observation du 7 septembre 1988. L'évaluation visuelle indique que quatre des treize traitements ont été vraiment efficaces contre les quatre-temps (répression de 40 à 55 %). Le calcul de la densité effectué en 1988 indique que seulement cinq traitements ont effectivement réduit la densité des quatre-temps (de 5,3 à 36,8 %). Aucune réduction supplémentaire de la densité n'a été observée en 1989. Le meilleur traitement selon la baisse de densité des quatre-temps était le sulfométuron méthyl + hexazinone Agral 90 (0,150 + 3 kg (i.a.)/ha + 0,25 % v/v). Une certaine répression des quatre-temps et une réduction de leur densité ont eu lieu, mais à des niveaux beaucoup trop bas pour être acceptables. Les recherches doivent se poursuivre.

INTRODUCTION: Despite the registration of a number of herbicides for weed control in lowbush blueberry fields, there are no herbicides that are effective in controlling Cornus canadensis L. (bunchberry). Bunchberry is able to escape control from the registered herbicides, due to its extensive underground rhizome system, and its ability to continuously produce new shoots throughout its growing season. The ability of this species to adapt and survive the production practices associated with the commercial production of blueberries, has led to its distinction of being the worst and most prevalent weed in blueberry fields (McCully, 1988).

Bunchberry control in the fall has never been extensively evaluated. A trial was therefore initiated and established to evaluate a number of herbicides for bunchberry control in the fall. At this time bunchberry plants should still have leaves present, hopefully making them more susceptible, while the blueberries will have dropped their leaves, making them more tolerant.

MATERIALS AND METHODS: This trial was established at Stewarton, Queens Co. in a silt loam soil having a pH of 4.9 and an organic matter content of 5.69%. Herbicides (see Table 1) were applied November 10, 1987 in a randomized complete block design with four replicates. Plot size was 2m x 6m. Treatments were applied to dormant blueberries using a CO_2 backpack sprayer in a volume of 200 L/ha at a pressure of 200 kPa. Rainfall was 6.1mm five days prior to application and 10.2mm ten days after. Visual ratings on weed control and crop phytotoxicity were taken June 29, July 27, and September 7, 1988. Bunchberry stem counts were taken in $50cm^2$ quadrats October 14, 1987, September 7, 1988 and July, 1989. Blueberries were mowed April 28, 1988. Logarithmic transformations were performed on the visual ratings and counts. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

Crop Tolerance: Although initial crop damage was observed from a number of treatments by the first rating date (June 29, 1988), only glyphosate resulted in significant crop damage as compared to the control. By the final rating date (September 7, 1988) however the only treatment significantly more phytotoxic than the untreated control was sulfometuron methyl (0.125 kg(a.i.)/ha). All other treatments appeared safe to apply on blueberries. Due to winter injury blueberry yields were not collected in 1989.

Bunchberry Control: Visual assessments indicated that few treatments resulted in significant bunchberry control throughout the rating periods. The 2,4-D + dicamba (55.0%), chlorsulfuron + Agral 90 (0.015 kg(a.i.)/ha + 0.25% V/V) (50.0%), sulfometuron methyl + hexazinone + Agral 90 (0.150 + 3.0 kg(a.i.)/ha + 0.25% V/V) (47.5%), and sulfometuron methyl + hexazinone + Agral 90 (0.10 + 3.0) kg(a.i.)/ha + 0.25% V/V) (40.0%) treatments were the only treatments which significantly controlled bunchberry throughout the rating periods (See Table 1). Although bunchberry was significantly controlled by these treatments, control levels were still too low and unacceptable.

Evaluation of bunchberry density counts collected before and the year after herbicide application indicated that only five treatments actually reduced bunchberry densities. Sulfometuron methyl + hexazinone + Agral 90 (0.15 + 3.0) kg (a.i.)/ha + 0.25% V/V) reduced bunchberry densities (36.8%) followed by chlorsulfuron + Agral 90 (0.015 kg(a.i.)/ha + 0.25% V/V) (19.7%), sulfometuron methyl + hexazinone + Agral 90 (0.10 + 3.0) kg(a.i.)/ha + 0.25% V/V) (14.4%), sulfometuron methyl + Agral 90

(0.10 kg(a.i.)/ha + 0.25% V/V) and sulfometuron methyl + Agral 90 (0.125 kg(a.i.)/ha + 0.25% V/V) (5.3%).

To determine how fast treated plots recovered, bunchberry density counts were also collected the following year on July 4, 1989. Results indicated that all treatments which had significantly reduced bunchberry densities from 1987 to 1988 did not provide long term control into the 1989 season, as notable increases in bunchberry densities resulted. Although plots which had been treated with glyphosate and 2,4-D + dicamba did not significantly reduce bunchberry densities from 1987 to 1988, they did not result in substantial density increases form 1988 to 1989, as was true with the other treatments. It is possible that these two treatments resulted in a more complete bunchberry rhizome budkill but of fewer buds. The other treatments which had initially reduced bunchberry densities may have severely injured more rhizome buds but not enough to completely kill them. As a result, it is possible that the buds recovered enough the following year to send up many new shoots.

CONCLUSIONS: The only treatment resulting in significant blueberry plant damage based upon visual evaluations by September 7, 1988 was sulfometuron methyl (0.125 kg (a.i.)/ha). Blueberries appeared tolerant to all other treatments.

Based upon bunchberry density counts, chlorsulfuron (0.015 kg (a.i.)/ha) and treatments containing sulfometuron methyl applied alone or in a tank mix with hexazinone were the only treatments resulting in actual bunchberry stand reductions. Tank mixes with hexazinone appeared to improve bunchberry control and improve crop tolerance. The best treatment based upon bunchberry density was sulfometuron methyl + hexazinone + Agral 90 ((0.150 + 3.0) kg (a.i.)/ha). Despite bunchberry density reductions from the treatments, bunchberry was still not controlled to acceptable levels. The following year no carryover control resulted from these treatments. Glyphosate and dicamba + 2,4-D treatments did, however, appear to slow down increases in bunchberry densities between 1988 and 1989. Further research needs to be conducted to improve control and further reduce bunchberry densities and for longer periods of time.

References: McCully, K.V. 1988. Weed Problems in Nova Scotia Blueberry fields. M.Sc. thesis Dept. Plant Science, McGill University, Montreal, pp 209.

Acknowledgements - Special thanks are extended to Charlie Lockhart and Bridges Brothers Ltd. who provided the blueberry field, and Margaret Mann for her assistance with the trial.

TABLE 1: DENSITIES AND VISUAL RATINGS

Treatment	Rate kg(a.i.)8/h	Visual Ratings % Crop Damage Sept7/88	% Weed Control Sept7/88	Bunchberry Density* m^2 (pre-trt) Oct14/87	Sept7/88	Aug15/89
Control	---	0.0	20.0	142 NS	161 NS	249 NS
Hexazinone	2.200	0.0	5.0	146 NS	189 NS	276 NS
Sulfometuron methyl + Agral 90	0.075 + .25% V/V	0.0	42.5	120 NS	128 NS	196 NS
Sulfometuron methyl + Agral 90	0.100 + .25% V/V	5.0	46.3	138 NS	128 NS	256 NS
Sulfometuron methyl + Agral 90	0.125 + .25% V/V	7.5	32.5	178 NS	169 NS	203 NS
Chlorsulfuron + Agral 90	0.005 + .25% V/V	0.0	27.5	106 NS	137 NS	169 NS
Chlorsulfuron + Agral 90	0.010 + .25% V/V	0.0	5.0	174 NS	195 NS	386 NS
Chlorsulfuron + Agral 90	0.015 + .25% V/V	5.0	50.0	100 NS	81 NS	147 NS
Glyphosate	2.000	0.0	30.0	88 NS	127 NS	127 NS
Sulfometuron methyl + Hexazinone + Agral 90	0.100+ 3.000+ .25% V/V	0.0	40.0	164 NS	140 NS	310 NS
Sulfometuron methyl + Hexazinone + Agral 90	0.150+ 3.000+ .25% V/V	2.5	47.5	138 NS	87 NS	151 NS
2,4-D + Dicamba	2.200+ 1.100	0.0	55.0	65 NS	105 NS	115 NS
Terbacil + Atrazine	1.500+ 6.000	0.0	0.0	174 NS	195 NS	324 NS

* Means with the same letter are not significantly different at the 0.05 level of significance according to the Duncan's Multiple Range Test.

BUNCHBERRY CONTROL IN WILD LOWBUSH BLUEBERRIES

K. V. McCully, D. O. Hanscomb

Abstract: Chlorsulfuron and Metsulfuron methyl were each evaluated in separate trials to determine their efficacy in controlling bunchberry in wild lowbush blueberries. Neither of the two products at any rates tested resulted in satisfactory bunchberry control. Initial crop damage was observed from chlorsulfuron but not metsulfuron methyl. No significant differences in yields or bunchberry counts existed from either herbicide at any rate. Further evaluation on higher rates should be conducted.

RÉPRESSION DES QUATRE-TEMPS DANS LES CULTURES DE BLEUETS NAINS SAUVAGES

Résumé: Le chlorsulfuron et le metsulfuron méthyl ont été tous deux soumis à des essais distincts afin de déterminer leur efficacité contre les quatre-temps dans les cultures de bleuets nains sauvages. Aucun des deux produits n'a donné de résultats satisfaisants aux doses appliquées. Des dommages ont été observés au début sur les bleuets traités avec le chlorsulfuron mais non sur ceux traités avec le metsulfuron méthyl. Les deux herbicides n'ont entraîné aucune différence importante dans le rendement ou dans le nombre de quatre-temps, à toutes les doses appliquées. Il faut procéder à d'autres évaluations avec des doses plus élevées.

INTRODUCTION: Since the registration of Velpar (hexazinone), almost all New Brunswick blueberry fields have been treated at least once and many three or four times. As a result, many of the weeds traditionally associated with blueberry fields were controlled, allowing for much cleaner fields. However, with fewer weeds and less competition, weeds not controlled by Velpar were permitted to thrive and spread more rapidly. One of these such weeds was Cornus canadensis L. or bunchberry, a low lying native herbaceous species which spreads and survives in much the same manner as blueberries. As a result management practices commonly associated with blueberry production also promoted bunchberry growth and survival. Since the registration of Velpar, bunchberry has become the most serious weed problem in lowbush blueberry fields (McCully, 1988). Two trials were established to evaluate the efficacy of 1) chlorsulfuron (Glean) and 2) metsulfuron methyl (Ally) on controlling bunchberry in N.B. blueberry fields.

MATERIALS AND METHODS: Two separate herbicide trials to evaluate chlorsulfuron and metsulfuron methyl, were established in a lowbush blueberry field in Pennfield, Charlotte County.

The metsulfuron methyl trial was established in a sandy loam soil having a pH of 5.0 and an organic matter content of 4.57%. Preemergence (PRE) herbicides (see table 1) were applied May 20, 1988 of the prune year. Rainfall was 33 mm five days prior to application and 28.6 mm ten days after.

indicated no significant differences.

CONCLUSION: None of the chlorsulfuron or metsulfuron methyl rates tested provided bunchberry control. Some early suppression was evident but regrowth and recovery levels were unacceptable. Some initial crop injury was observed from chlorsulfuron but not metsulfuron methyl. No significant yield differences existed in either trial however. Higher rates of these two products should be evaluated.

TABLE 1. Densities, yields and visual ratings from metsulfuron methyl trial.

Treatment	Rate kg(a.i) /ha	Crop Damage% Sept8/88	Weed Control% Sept8/88	Bunchberry Density m^2 Sept8/88	Yield Aug18/89 T/ha
Control	-	0.0	0.0	148 NS	1.51 NS
Metsulfuron methyl	0.0025	1.3	12.3	135 NS	1.48 NS
Metsulfuron methyl	0.0050	0.0	5.1	143 NS	2.08 NS
Metsulfuron methyl	0.0075	6.3	11.3	147 NS	1.17 NS
Metsulfuron methyl	0.0100	0.0	7.5	146 NS	1.56 NS
Hexazinone	2.0	0.0	3.3	151 NS	1.50 NS

TABLE 2. Densities, yields and visual ratings from chlorsulfuron trial.

Treatment	Rate kg(a.i) /ha	Crop Damage% Sept8/88	Weed Control% Sept8/88	Bunchberry Density m^2 Sept8/88	Yield Aug18/89 T/ha
Control	-	0.0	0.0	143 NS	1.04 NS
Chlorsulfuron	0.010	0.0	0.0	136 NS	1.41 NS
Chlorsulfuron	0.015	0.0	7.5	115 NS	1.98 NS
Chlorsulfuron	0.020	0.0	0.0	133 NS	1.97 NS
Chlorsulfuron	0.025	20.0	10.8	120 NS	2.18 NS

REFERENCES:

McCully, K.V. 1988. Weed Problems in Nova Scotia Blueberry Fields. M.Sc. Thesis Dept. Plant Science, McGill University Montreal. pp 210.

ACKNOWLEDGEMENTS: Special thanks is extended to David Hatt who provided the blueberry field for our trials and Margaret Mann for her assistance with the trial.

The chlorsulfuron trial was established in a sandy loam soil having a pH of 4.9 and an organic matter content of 4.68%. Preemergence (PRE) herbicides (see Table 2) were applied May 17, 1988 of the prune year. Rainfall was 31.8 mm five days prior to application and 29.0 mm ten days after.

Experimental design for the two trials was a randomized complete block design with four replicates. Plot size was 2m x 6m. Treatments were applied with a CO_2 backpack sprayer in a water volume of 250L/ha at a pressure of 200 kPa. Visual ratings on crop phytotoxicity and weed control, for both trials, were taken on June 14, July 12, August 12 and September 8, 1988. Density counts were taken in 50 cm^2 quadrats September 8, 1988 and August 16, 1989. Harvests were August 18, 1989. Logarithmic transformations were performed on the visual evaluations and yields. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

A) Chlorsulfuron trial

Although initial crop damage was observed from all treatments, none of them were significantly higher than the control until the August 12 rating date. At this time only the high rate of chlorsulfuron (0.025 kg(a.i.)/ha) resulted in damage significantly higher. By September 8, however none of the treatments were significantly different from the control. Evaluation of yields the following year also indicated no significant differences from the control.

Evaluation of bunchberry control by the June 14 rating date (29 days after application) indicated that all treatments resulted in significant bunchberry control as compared to the control. Ratings taken after this date indicated that the bunchberry plants recovered and no significant differences existed. Analysis of bunchberry counts collected from each plot both years, also indicated no significant differences.

b) Metsulfuron methyl trial

None of the metsulfuron methyl rates tested resulted in crop damage significantly different from the control or the standard hexazinone, during any of the rating periods. Yields collected the following year also indicated no significant differences.

Some initial bunchberry control was observed from the 0.0075 and 0.01 kg(a.i)/ha rates during the first rating period (June 14-26 days after application) but by the July 12 rating, no significant differences were observed as compared to the untreated control. Analysis of bunchberry counts taken from each plot both years also

EVALUATION OF NON 2,4-D HERBICIDES FOR WEED CONTROL IN TURF

K. V. McCully, M.A. Mann, D. O. Hanscomb

ABSTRACT: Three separate trials to evaluate alternative herbicides to 2,4-D for their effectiveness on weed control with minimal turf damage were established. Post emergence herbicides applied either alone, in preformulated mixes, or in tank mixes were evaluated. Visual ratings on turf tolerance and individual weed species control were collected. No significant turf damage was observed from any of the herbicides throughout the rating periods. Weed control with the non 2,4-D herbicides appeared to be more effective or as effective on dandelion, fall dandelion and hawkweed than the 2,4-D/MCPP/dicamba standard. Some of the most promising treatments included MCPA/MCPP/Dicamba (200/100/18g/L), Clopyralid/Triclopyr in preformulated mix and CGA131036 applied alone.

ÉVALUATION DE SUBSTITUTS DU 2,4D POUR LA SUPPRESSION DES MAUVAISES HERBES DANS LES CULTURES DE GAZON

Résumé: Trois essais distincts ont permis d'évaluer l'efficacité de substituts du 2,4-D pour la suppression des mauvaises herbes dans les cultures de gazon. L'évaluation portait sur des herbicides de postlevée appliqués seuls, en mélanges préformulés ou en mélanges faits dans le pulvérisateur. Des évaluations visuelles des dommages causés aux plantes et de la répression de certaines espèces de mauvaises herbes ont été réalisées. Aucun dommage aux plantes n'a été observé aux endroits où les herbicides avaient été appliqués sur des peuplements de gazon bien établis. La suppression des mauvaises herbes avec des herbicides autres que le 2,4-D semble être autant ou plus efficace pour le pissenlit, le léontodon automnal et l'épervière que le produit standard 2,4-D/MCPP/dicamba (95/50/9 g/L). Parmi les traitements les plus prometteurs aux doses testées, on trouve le MPCA/MCPP/dicamba (200/100/18 g/L), le clopyralid/triclopyr en mélange préformulé et le CGA131036 appliqué seul.

INTRODUCTION: The herbicide 2,4-D has been the answer to many problems connected with the maintenance of a neat, weed-free lawn. It is inexpensive, readily available, easy to apply, and will control many of the common weed species. It is used to control broadleaf weeds in everything from lawns to cereal fields. About 3600 metric tonnes of 2,4-D are used in Canada each year. This represents about 25% of total herbicide use.

In 1980 it was discovered that 2,4-D products may contain dioxin contaminants. This prompted Agriculture Canada to re-evaluate 2,4-D. Most experts conclude that 2,4-D does not pose a substantial risk when properly used according to label directions. Agriculture Canada's present approach is to allow the continued judicious use of 2,4-D.

The possibility that further restrictions may be imposed on 2,4-D weighs heavily on the ornamental turf industry. A trial was therefore established to evaluate alternative herbicides and mixtures to the most commonly used 2,4-D mixture, Killex (2,4-D/MCPP/dicamba).

MATERIALS AND METHODS: Three separate trials were established in a mature turf stand in Fredericton, York Co. Soil type was a silt loam with a pH of 7.3.

Experimental design was a randomized complete block with four replicates. Plot size was 2m X 2m. Post emergence (POST) herbicides (see table 1,2 and 3) were applied to actively growing turf June 19, 1989. Treatments were applied using a CO_2 backpack sprayer in a water volume of 500 L/ha at a pressure of 200 kPa. Rainfall was 27mm 5 days prior to application and 0 mm 10 days after. Visual assessments on crop phytotoxicity and weed control were collected June 28, July 5, July 12, July 19, August 2 and August 30. Analysis of variance was performed on the visual evaluations and means separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Trial 1. Comparison of 2,4-D/MCPP/dicamba (2,4-D Killex) and MCPA/MCPP/dicamba (MCPA Killex).

MCPA/MCPP/dicamba at both rates tested provided significantly higher hawkweed control than the standard 2,4-D/MCPP/dicamba and untreated control from the July 12 rating onward. By the final evaluation date (August 30) MCPA/MCPP/dicamba rates of 1.1/0.55/1.01 and 1.4/0.70/0.126 kg(a.i.)/ha resulted in 76.3% and 71.0% hawkweed control as compared to the standard 2,4-D/MCPP/dicamba (40.9%) (See table 1).

HOE 033171 and HOE 046360 resulted in 0% hawkweed control. These treatments were included in the trial to test turf tolerance. No broadleaf weed control was expected as they are post emergent herbicides for crabgrass control. No turf damage was observed from any treatment by the final evaluation date (See Table 1.).

Trial 2 Comparison of, 2,4-D Killex (2,4-D/MCPP/dicamba) with Clopyralid, Triclopyr and Dicamba in various mixtures and combinations.

All treatments significantly controlled hawkweed during all ratings as compared to the control. There was no significant difference between the standard 2,4-D/MCPP/dicamba (1.14/0.6/0.108 kg(a.i.)/ha) and any of the other treatments by the final August 30 rating (see Table 2). All treatments controlled hawkweed over 78% from July 18 onward. By the final rating, treatments resulting in over 88% hawkweed control, but not significantly different from one another, included: clopyralid/triclopyr + dicamba (0.18/0.55+ 0.108 kg(a.i.)/ha) (93.0%); clopyralid/triclopyr/dicamba (0.21/0.42/0.08 kg(a.i.)/ha) (89.0%) and clopyralid/triclopyr (0.21/0.64 kg (a.i.)/ha) (88.7%).

Although a number of treatments provided higher hawkweed control than the low rate of clopyralid/triclopyr

Trial 1: Comparison of 2,4-D/MCPP/dicamba (2,4-D Killex) and MCPA/MCPP/dicamba (MCPA Killex)

Visual evaluations of Crop Damage and Weed Control.

TREATMENT	RATE kg(a.i.)/ha	VISUAL RATINGS %TURF DAMAGE.	% HAWKWEED CONTROL
MCPA/MCPP/Dicamba	1.1/0.55/0.1	0	7.63a
MCPA/MCPP/Dicamba	1.4/0.70/0.126	0	71.0b
2,4-D/MCPP/Dicamba	1.14/0.6/0.108	0	40.9c
Hoe 033171	0.2	0	0d
Hoe 046360	0.1	0	0d
Control	-	0	0d

MCPA/MCPP/dicamba (200/100/18 g/L)
2,4-D/MCPP/dicamba (95/50/9 g/L)

*means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's Multiple Range Test.

TRIAL 2. Comparison of Clopyralid, Triclopyr and Dicamba in Various Mixtures and Combinations with 2,4-D Killex (2,4-D/MCPP/dicamba)

Visual Evaluations of Crop Damage and Weed Control (August 30, 1989)

TREATMENT	RATE KG(a.i.)/ha	% TURF DAMAGE	% WEED CONTROL HW	DD	FD*
2,4-D/MCPP/dicamba	1.14/0.6/0.108	0	86.3abc	82.5b	-
clopyralid/triclopyr/dicamba	0.14/0.28/0.05	0	85abc	85.0ab	65.0d
clopyralid/triclopyr/dicamba	0.21/0.42/0.08	0	89.0ab	100.0a	100.0a
clopyralid/trilocpyr/dicamba	0.28/0.56/0.11	0	78.3c	100a	100.0a
clopyralid/triclopyr	0.18/0.55	0	83.2bc	92.5ab	74.0c
clopyralid/triclopyr	0.21/0.64	0	88.7ab	91.3ab	74.0c
clopyralid/triclopyr + dicamba	0.18/0.55 + 0.108	0	93.0a	90.0ab	88.0b
clopyralid/triclopyr + dicamba	0.21/0.64 + 0.108	0	85.0abc	90.0ab	84.0b
control	- 0	0.0d		0.0c	0.0e

HW = Hawkweed, DD = Dandelion, FD = Fall Dandelion

*means of three reps due to inconsistent weed coverage over the four replicates

-means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's Multiple Range Test.

TRIAL 3. Comparison of (2,4-D Killex) with CGA 131036 applied alone or mixed with Triclopyr and/or dicamba.

Visual evaluation of Crop Damage and Weed Control (August 30, 1989)

TREATMENT	RATE kg(a.i.)/ha	% WEED CONTROL HW	FD*	HW*
CGA 131036	0.15	80bcd	93a	58 bcd
CGA 131036	0.20	83b	82d	78a
CGA 131036	0.25	81bc	92a	56bcd
Dicamba	0.108	13h	0h	0f
Triclopyr	0.425	50g	62f	46d
CGA 131036 + Dicamba	0.15 + .108	57f	52g	52d
CGA 131936 + Dicamba	0.20 + .108	60f	-	68ab
CGA 131036 + Dicamba	0.25 + .108	81bc	90ab	74.0a
CGA 131036 + Triclopyr	0.15 + .425	74cde	81d	51d
CGA 131036 + Triclopyr	0.20 + .425	73de	85cd	50d
CGA 131936 + Triclopyr	0.25 + .425	71e	73e	50d
CGA 131036 +Dicamba+Triclopyr	0.15 + .108 +.425	62f	76e	-
CGA 131036 +Dicamba+Triclopyr	0.20 + .108 +.425	58f	87bc	73a
CGA 131036 +Dicamba+Triclopyr	0.25 + .108 +.425	80bcd	78.7e	66abc
2,4-D/MCPP/Dicamba	1.14 + 0.6 + 0.108	96a	90ab	54cd
Check	-	0i	0h	0e

-2,4-D/MCPP/dicamba (95/50/9 g/L)
DD = Dandelion; FD = Fall dandelion; HW = Hawkweed
*Means of three replicates due to inconsistent weed coverage between replicates
-means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's Multiple Range Test.

(0.18/0.55 kg(a.i.)/ha) (83.2%), only one treatment clopyralid/triclopyr + dicamba (0.18/0.55 + 0.108 kg(a.i.)/ha) (93.0%) resulted in significantly higher control by the final rating.

All treatments tested were therefore as effective as the standard 2,4-D/MCPP/dicamba mix and there did not appear to be any major advantage in adding dicamba to the clopyralid/triclopyr mixes for hawkweed control.

All treatments significantly controlled dandelion during all ratings. From the August 2 rating date onward all treatments resulted in higher dandelion control than the standard 2,4-D/MCPP/dicamba, but not always significantly.

All treatments controlled dandelion over 82% from July 19th onward. By the final rating, treatments resulting in over 92% dandelion control, but not significantly different from one another, included: clopyralid/triclopyr/dicamba (0.21/0.42/0.08 kg (a.i.)/ha) (100%); clopyralid/triclopyr/dicamba (0.28/0.56/0.11 kg(a.i.)/ha) (100%) and clopyralid/triclopyr (0.18/0.55 kg(a.i.)/ha) (92.5%) (See Table 2). Clopyralid/triclopyr at the low rate tested, provided excellent dandelion control. There was no significant advantage in using a higher rate or in combining clopyralid/triclopyr with dicamba in preformulated or tank mixes. Overall, all treatments provided excellent dandelion control.

All treatments, except 2,4-D/MCPP/dicamba, significantly controlled fall dandelion during all ratings. There was not enough fall dandelion in 2,4-D/MCPP/dicamba plots to be accurately evaluated. All treatments except clopyralid/triclopyr/dicamba (0.14/0.28/0.05 kg(a.i./ha) controlled fall dandelion over 74% from July 5th onward. By the final rating, treatments resulting in over 80% fall dandelion control included: clopyralid/triclopyr/dicamba (0.21/0.42/0.08 kg(a.i.)/ha) (100%); clopyralid/triclopyr/dicamba (0.28/0.56/0.11 kg(a.i.)/ha) (100%) clopyralid/triclopyr + dicamba (0.18/0.55 + 0.108 kg (a.i)/ha) (88%) and clopyralid/triclopyr + dicamba 0.21/0.64 + .108 kg(a.i.)/ha) (84%).

For fall dandelion control, it appears that dicamba should be added to the clopyralid/triclopyr treatment. The preformulated mix of clopyralid/triclopyr/dicamba was significantly better than clopyralid/triclopyr + dicamba for unexplained reasons. There was no turf damage observed from any of the treatments by the final evaluation date.

TRIAL 3. Comparison of 2,4-D Killex (2,4-D/MCPP/dicamba) with CGA 131036 applied alone or mixed with triclopyr and/or dicamba.

A number of weed species were found within each replicate but not always consistently within each plot. Three weeds, which were relatively consistent from plot to plot were dandelion, fall dandelion and hawkweed. Control of each of these weeds were evaluated separately by each herbicide (see Table 3).

Dandelion was significantly controlled as compared to the untreated control plots by all treatments tested (see Table 3). Treatments providing over 81% control by the final evaluation d[illegible] included: the standard 2,4-D/MCPP/dicamba (95/5[illegible] g/L) (96%); CGA 131036 (0.20 kg(a.i.)/ha) (83%); CGA 131036 (0.25 kg (a.i.)/ha) (81.0%); and CGA 131036 + dicamba (0.25 + 0.108 kg (a.i.)/ha) (81.0%). Triclopyr applied alone was significantly better than dicamba applied alone, but both resulted in very poor dandelion control throughout the rating periods. Evaluation of the three CGA 131036 rates applied alone indicated that they were not significantly different from each other. The addition of triclopyr and/or dicamba to CGA 131036 did not result in any significant increases in dandelion control.

The standard (2,4-D/MCPP/dicamba) treatment was only significantly higher than the three CGA 131036 treatments in controlling dandelion for the last rating date. These results therefore indicated that although all treatments were less effective than 2,4-D/MCPP/dicamba, the low rate of CGA 131036 (0.15 kg(a.i.)/ha) was as effective or more effective than the higher CGA 131036 rates or mixes with triclopyr and/or dicamba.

Fall dandelion was significantly controlled, as compared to the untreated control plots by all treatments except dicamba throughout the rating periods. Treatments providing over 90% control included: CGA 131036 (0.15 kg (a.i.)/ha) (93%); CGA 131036 (0.25 kg(a.i.)/ha) (92%); standard 2,4-D/MCPP/dicamba (95/50/9 g/L) (90%) and CGA 131036 + dicamba (0.25+ 0.108 kg (a.i.)/ha) (90%).

Triclopyr applied alone was significantly better than dicamba applied alone, but both resulted in poor fall dandelion control throughout the rating periods. Evaluation of the three CGA 131036 treatments applied alone indicated that the 0.15 and 0.25 kg (a.i.)/ha rates were the two most effective treatments and not significantly different from each other or the standard 2,4-D/MCPP/dicamba. For reasons not understood, the 0.20 kg (a.i.)/ha rate resulted in significantly reduced

control as compared to the above rates. The addition of triclopyr and/or dicamba did not result in any increased fall dandelion control when applied with the 0.15 and 0.25 kg/(.ai.)/ha rates of CGA 131036. The addition of triclopyr and dicamba to the CGA 131036 0.20 kg(a.i.)/ha rate did however result in significantly higher fall dandelion control than if not applied. These results therefore indicated that the low rate of CGA 131036 (0.15 kg(a.i.)/ha) was as effective as the standard 2,4-D/MCPP/dicamba and as effective or more effective than the higher CGA 131036 rates or mixes with triclopyr and/or dicamba.

Hawkweed was significantly controlled by all treatments except dicamba by the final evaluation date (see Table 3). Treatments providing over 70% hawkweed control included, CGA 131036 (0.20 kg (a.i.)/ha) (78%); CGA 131036 + dicamba (0.25 + .108 kg(a.i.)/ha) (74%) and CGA 131036 + dicamba + triclopyr (0.20 + .108 + .425 kg(a.i.)/ha) (73%). Triclopyr applied alone was significantly better than dicamba applied alone, but both resulted in poor hawkweed control throughout the rating periods. Evaluation of the three CGA 131036 treatments applied alone indicated that the 0.20 kg(a.i.)/ha rate was the most effective and significantly better than the 0.15 and 0.25 kg (a.i.)/ha rates. The addition of triclopyr and/or dicamba did not result in any significant increase in hawkweed control when applied with the CGA 131036 0.15 and 0.20 kg(a.i.)/ha rates. The addition of dicamba to the CGA 131036 (0.25 kg(a.i.)/ha) rate did however result in increased hawkweed control than if CGA 131036 were applied alone. CGA 131036 treatments applied alone were as effective or more effective than the standard 2,4-D/MCPP/dicamba treatment.

Overall results indicated that the CGA 131036 (0.15 and 0.20 kg(a.i.)/ha) rates were as effective or more effective in controlling hawkweed than the 2,4-D/MCPP/dicamba standard mix and treatment mixes containing triclopyr and/or dicamba.

There was no turf damage observed from any of the treatments by the final August 30 evaluation date.

CONCLUSION: In trial 1 (comparison of 2,4-D Killex and MCPA Killex) it was found that the two MCPA Killex (MCPA/MCPP/dicamba) mixes resulted in significantly higher hawkweed control than the standard 2,4-D Killex (2,4-D/MCPP/dicamba). The best treatment of MCPA/MCPP/dicamba resulted in 76.3% hawkweed control. None of the treatments resulted in turf damage.

In Trial 2 (comparisons of 2,4-D Killex with clopyralid, triclopyr and dicamba in various mixtures and combinations,) it was found that all treatments tested were as effective or more effective than the standard 2,4-D/MCPP/dicamba (2,4-D Killex) treatment in controlling hawkweed and dandelion. All treatments resulted in over 78% hawkweed and 92.5% dandelion control by the final evaluation date. There did not appear to be any significant advantage in adding dicamba to the clopyralid/triclopyr mixtures for controlling hawkweed or dandelion. For controlling fall dandelion however the

addition of dicamba to the clopyralid/triclopyr mixes was necessary for effective control. No turf damage was observed from any of the treatments.

In trial 3 (comparison of 2,4-D Killex with CGA 131036 applied alone or mixed with triclopyr and/or dicamba), results indicated that the addition of triclopyr and/or dicamba to CGA 131036 rates did not result in any significant increases in dandelion control. None of the treatments were as effective as the 2,4-D/MCPP/dicamba treatment in controlling dandelion however. When evaluating the treatments for fall dandelion control, it was found that the low rate of CGA 131036 (0.15 kg(a.i.)/ha) was as effective as the standard 2,4-D/MCPP/dicamba and as effective or more effective than the higher CGA 131036 rates or mixes with triclopyr and/or dicamba. When evaluating the treatments for hawkweed control the CGA 131036 rates of 0.15 and 0.20 kg(a.i.)/ha were more effective than the 2,4-D/MCPP/dicamba standard mix and mixes containing triclopyr and/or dicamba. No turf damage was observed from any treatment by the final August 30 evaluation date.

ACKNOWLEDGEMENTS

Appreciation is extended to Unipress Ltd. of Fredericton for providing the turf trial site.

EFFECT OF TOPKILL DATE ON YIELD OF DESIRÉE CULTIVAR SEED POTATOES

R.P. Hinds and A.F. PERLEY

ABSTRACT: As part of the ongoing efforts to develop a management profile for the potato cultivar Desirée, three topkill dates were imposed upon the crop - an early date, August 8, a medium date, August 25 and a late date, August 30 (mandatory date). Total yield was significantly reduced (24-46%) by the early topkill date compared to the later dates. The later topkill dates produced significantly higher yields of large tubers and marketable tubers in the size range 30-60 mm. There were no significant differences in total yield and yield in the size range 30-60 mm between the medium and the late topkill dates. Scab incidence was significantly higher in the later topkill dates over the early date. This was due not to greater infection but from an enlargement of lesions as the tuber matured and expanded.

EFFET DE LA DATE DE DÉFANAGE SUR LE RENDEMENT DU CULTIVAR DE POMMES DE TERRE DE SEMENCE DESIRÉE

Résumé: Dans le cadre des tentatives faites actuellement en vue de dresser un profil de gestion pour le cultivar de pommes de terre de semence Desirée, on a établi trois dates pour le défanage de la récolte: une date précoce (8 août), une date intermédiaire (25 août) et une date ultime (30 août). Le rendement total était beaucoup réduit (de 24 à 46 %) par le défanage hâtif, comparativement au défanage fait aux dates ultérieures. Le défanage aux dates plus tardives a produit des rendements plus élevés de gros tubercules et de tubercules commercialisables ayant un diamètre de 30 à 60 mm. Aucune différence importante n'a été notée dans le rendement total et le rendement de tubercules ayant un diamètre de 30 à 60 mm pour ce qui est de la date intermédiaire et la date ultime de défanage. Le taux de gale était beaucoup plus grand dans les pommes de terre défanées aux deux dernières dates que dans celles défanées plus tôt. Ce phénomène n'est pas attribuable à une infection plus grave, mais plutôt à l'agrandissement des lésions à mesure que les tubercules mûrissaient et grossissaient.

INTRODUCTION: The recent introductions of yellow-flesh foreign potato cultivars in the New Brunswick system, have created the need to establish management profiles for these new cultivars. Factors which affect yield and quality such as nitrogen rates, intra-row spacings, whole versus cut seed, length of growing season, topkill dates, etc., must be investigated in order to provide producers with the technology required to grow these new varieties and be competitive. Desirée is a Dutch introduction being grown for the Cuban market, which requires tubers in the size range 35-55 mm. This experiment was designed to examine the effects of topkill date on the size distribution of yield of Desirée seed for the Cuban market.

METHOD: The experiment was a RCBD with four replicates (blocks).
Treatments were:
Topkill Date of August 18.
Topkill Date of August 25.
Topkill Date of August 30 - Mandatory.
Topkill date set by the industry.

Cut seed (60g in weight) was planted on June 1, 1989 with 135 kg/ha of N, P_2O_5 and K_2O applied by placement at planting.

Inter-row spacing was 91 cm and intra-row spacing was 30 cm. Plot size was 195 m^2. Rotation practice was potatoes, grain, potatoes, winter rye, potatoes. Soil testing was done prior to planting. July was a particularly dry month as rainfall was only 60% of normal.

RESULTS AND DISCUSSION: Yield: Table 1 shows the effect of topkill date on yield of the various sizes of Desirée seed. The medium and late topkill dates produced significantly higher total yield than the early topkill date. The difference in total yield is so large that a producer would stand to lose between 24-46% of his yield by killing the crop too early. The medium topkill date while not significantly different from the late topkill date, was in fact 10% less in total yield. Yield in the size range > 60 mm is not required by the Cuban trade and is difficult to market. These were all significantly different from each other. The early topkill date produced less tonnage of larger tubers than the other topkill dates. The later the topkill date, the greater was the tonnage of larger tubers. Yield in the size range 30-60 mm required by the trade for the Cuban market was significantly better (29%) in the medium and later topkill dates than the early one. There was no significant difference in yield of 30-60 mm size for the medium and late dates. Nor were there any significant differences in yield of tubers <30mm between the topkill dates.

TABLE 1: YIELD OF DESIRÉE SEED POTATO CULTIVAR AS AFFECTED BY DATE OF TOPKILL

Treatment	Yield t/ha			
	<30 mm	30-60 mm	>60 mm	Total
1. Aug.18-Topkill Date - Early	3.50^{A}	19.28^{B}	1.04^{C}	23.82^{B}
2. Aug.25-Topkill Date - Medium	3.05^{A}	25.00^{A}	3.06^{B}	31.71^{A}
3. Aug.30-Topkill Date - Late (Mandatory Date)	3.96^{A}	25.40^{A}	5.60^{A}	34.96^{A}

Duncan's Multiple Range Test - 0.05 level. Means with the same letter are not significantly different from each other.

Scab Incidence: Desirée is a scab susceptible cultivar and the field selected has a ten year history of scab. Scab incidence observed is shown in Table 2. No tuber had more than 1% of surface covered with scab. The later topkill dates produced a significantly higher yield of tubers with no visible scab lesions than the early topkill date as well as a higher yield of tubers with scab. There was no significant difference between the medium and late topkill date in relation to zero scab incidence. These differences in scab incidence are due, not to a greater infection on the larger tubers, but to enlargement and greater definition of the lesions as the tuber expands. The early topkill date produced 11% of the total yield with scab lesions versus 23% and 28% for the medium and late topkill dates.

TABLE 2: EFFECT OF TOPKILL DATE ON SCAB INCIDENCE IN DESIRÉE SEED POTATO CULTIVAR

Treatment	Yield t/ha Tuber area% covered with scab lesions	
	0%	<1%
Aug.18 Topkill Date-Early	21.51[B]	2.31[B] (*11%)
Aug.25 Topkill Date-Medium	25.75[AB]	5.93[A] (23%)
Aug.30 Topkill Date-Late	27.32[A]	7.64[A] (28%)

Duncan's Multiple Range Test - 0.05 level. Means with the same letter are not significantly different from each other in each class.

* Represents % of total yield.

Soil Analysis: Mean soil analysis for the main plots prior to planting indicates close similarity between plots and any differences seen in yield between the treatments can be attributed to the treatment themselves and not to soil fertility differences (Table 3).

TABLE 3: MEAN SOIL ANALYSIS RESULTS OF PLOTS PRIOR TO PLANTING - HOLMESVILLE CLAY LOAM SOIL SERIES

Treatment	pH	kg/ha P_2O_5	kg/ha K_2O	kg/ha Ca	kg/ha Mg	O.M. %
1. Aug.18-Topkill Date Early	5.7	513+	359	1626	213	3.2
2. Aug.25-Topkill Date Medium	5.5	513+	430	1757	240	3.3
3. Aug.30-Topkill Date	5.8	513+	430	1359	178	3.2

CONCLUSION: Early topkilling of the Desirée potato cultivar for seed greatly reduced the total yield and marketable yield in the size range 30-60 mm. Yield reduction varied between 24-46% for the early versus the later dates. Later topkilling resulted in a higher percentage of large tubers and a higher yield of tubers with scab. The latter was the result of enlargement and greater definition of the scab lesions on the larger tubers as they expanded rather than from a higher infection level.

ACKNOWLEDGEMENT: The authors respectfully acknowledge the efforts of G.P. Coté during the period the work was undertaken.

THE 1989 GROWING SEASON

George Read

ABSTRACT: The 1989 Growing season was characterized by variable conditions. The eastern half of the province was for the most part drier than the western half. Heat units were near normal and the frost incidence generally reflected normal spring frosts and slightly early fall frosts.

SAISON DE CROISSANCE 1989

Résumé: La saison de croissance 1989 a été caractérisée par des conditions atmosphériques variables. Le climat était plus sec dans la moitié est de la province que dans la moitié ouest. Les unités thermiques étaient près de la normale et l'observation du gel indique qu'en général, les gels printaniers étaient normaux et les gels automnals ont été assez hâtifs.

INTRODUCTION: Generalizing the weather conditions for and entire province for an entire season does not explain crop performance on individual farms or even separate regions for the most part. The climate of farms varies significantly from one location to another with such things as frost occurrence, crop development, planting, insect and disease development or harvesting operations. It is therefore necessary to evaluate specific varieties, recommendations and production practices with the most localized or representative information as possible.

Despite these farm scale influences, the overall performance of crops on a provincial scale can often be correlated with major deviations from normal growing season conditions, such as droughts, wet periods, extensive frosts or unusually warm or cold seasons. With these factors recognized, a general summary of the 1988 cropping season weather is presented.

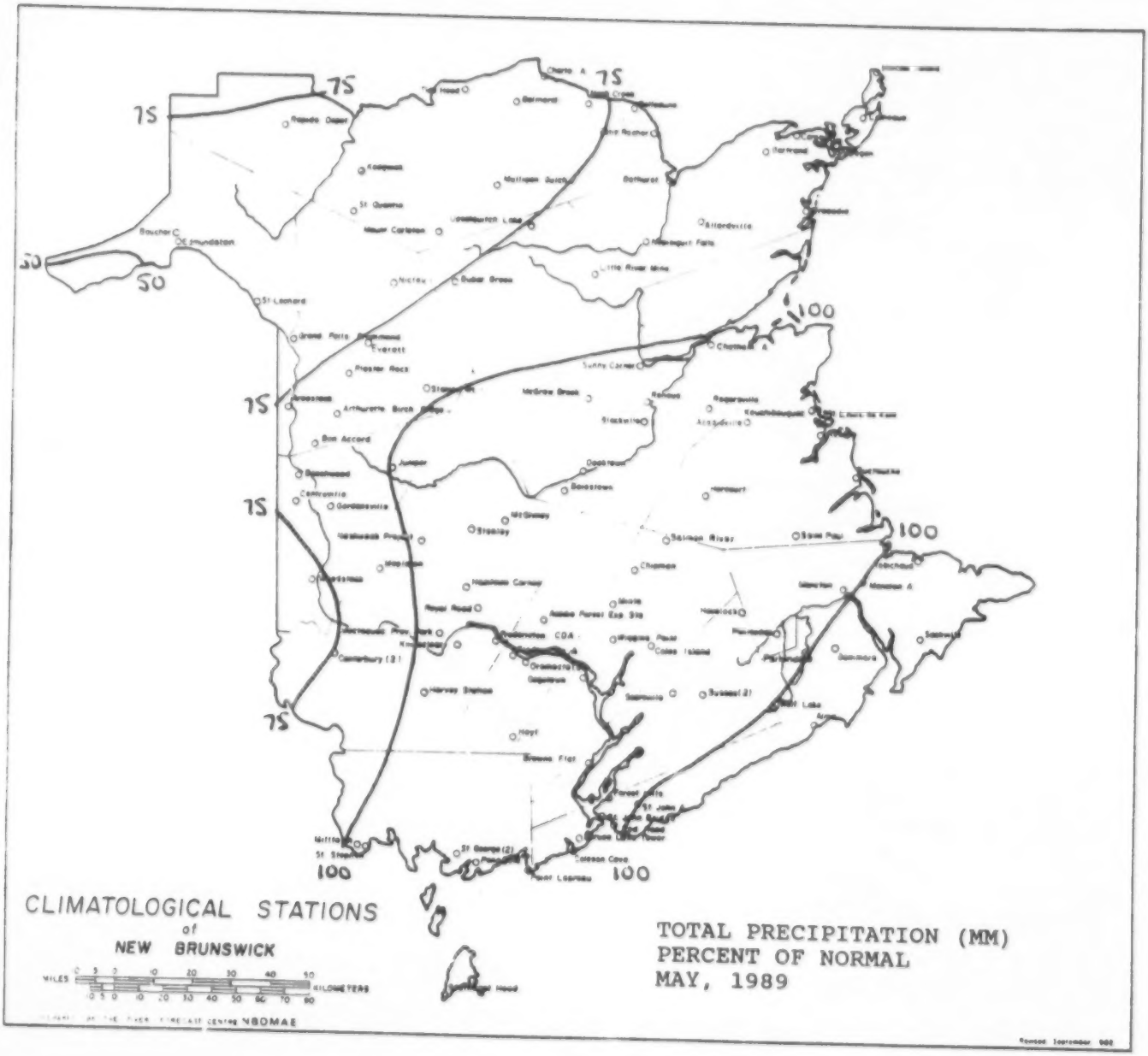
SUMMARY: The precipitation in the month of May was generally characterized by a wet Saint John river valley in the western part of the province running from Saint John to Grand Falls, including St. Stephen, Gagetown, Fredericton, Woodstock, and Centreville, which were well above normal. The eastern half of the Province was generally dry from Moncton in the South to Chatham in the North. Growing degree-days were well above normal all over the Province, often as high as fifty percent greater than normal.

June continued with warm temperatures and fairly well distributed rainfall. Most locations reported slightly below normal amounts however the Eastern part of the Province continued with dry conditions from Moncton through to The Acadian Peninsula.

double the normal amount. However, Moncton, Sussex, and Charlo were all below normal.

September was near normal conditions with rain hampering harvest activities the latter part of the month in Woodstock. Frost was evident from early-month onwards.

MAPS: The following maps, courtesy of the New Brunswick Department of the Environment and Environment Canada, depict temperature and precipitation values as a percent of normal for the months of May, June, July, August, and September for 1989. The results are based on unverified reports.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PERCENT OF NORMAL
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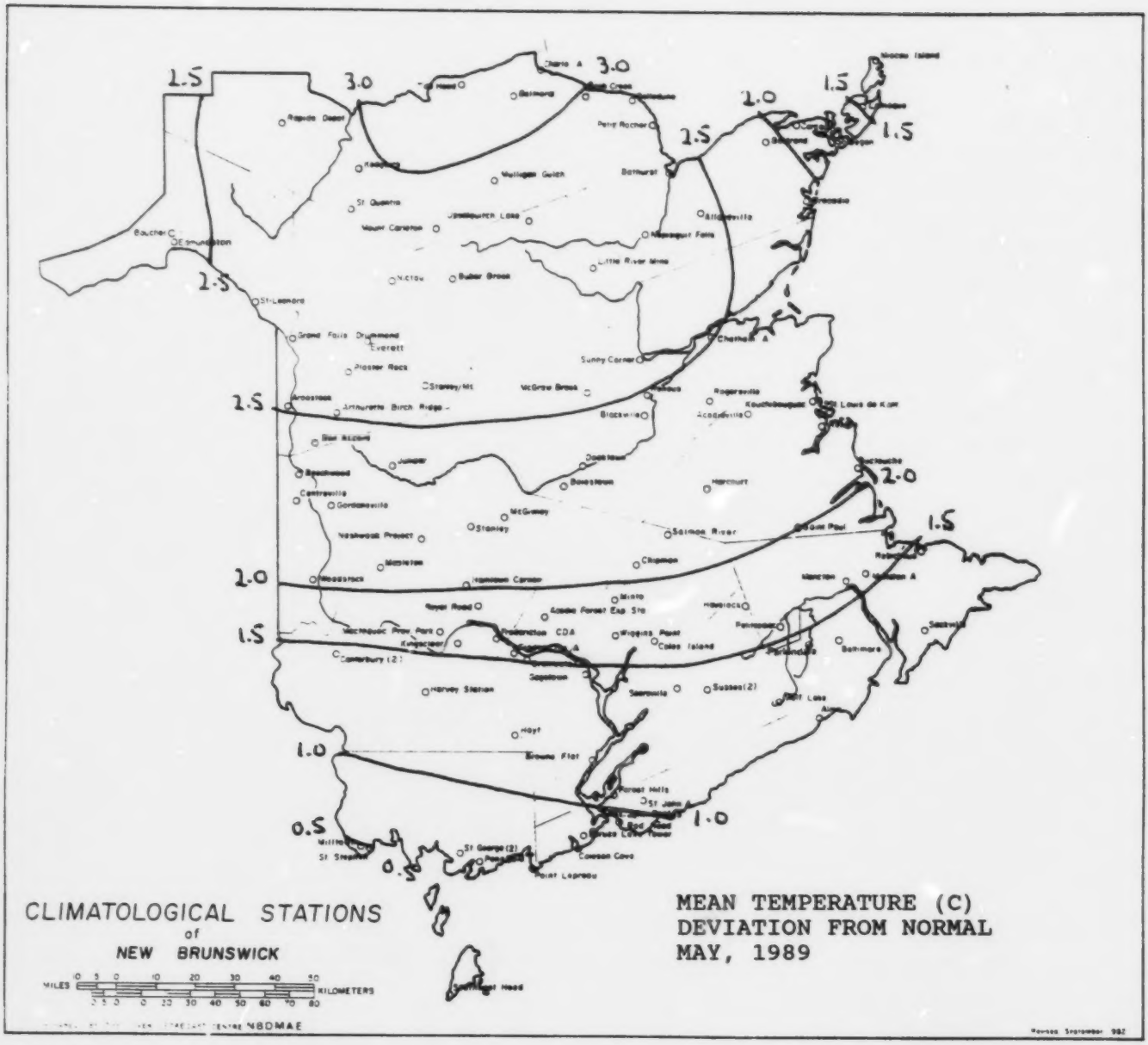
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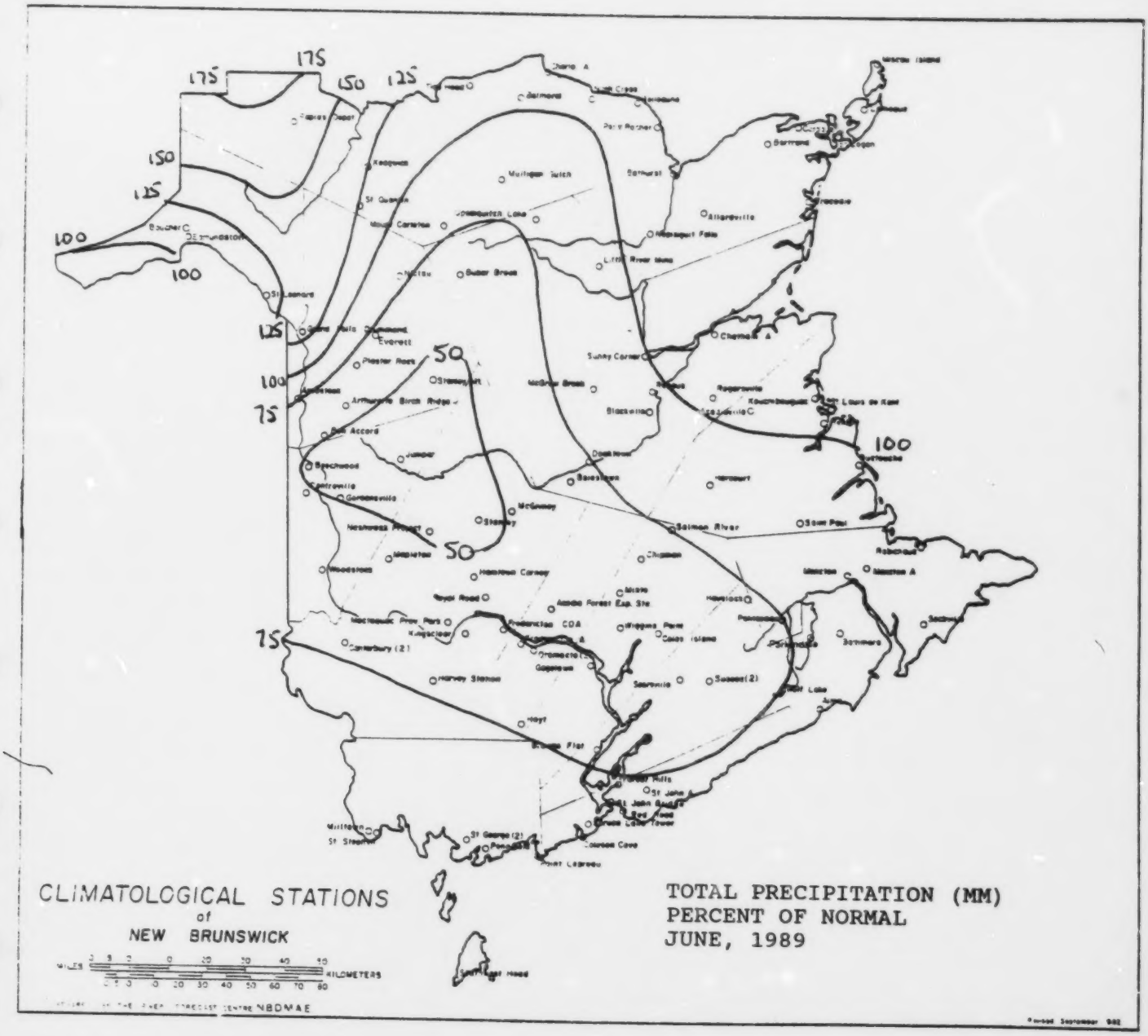
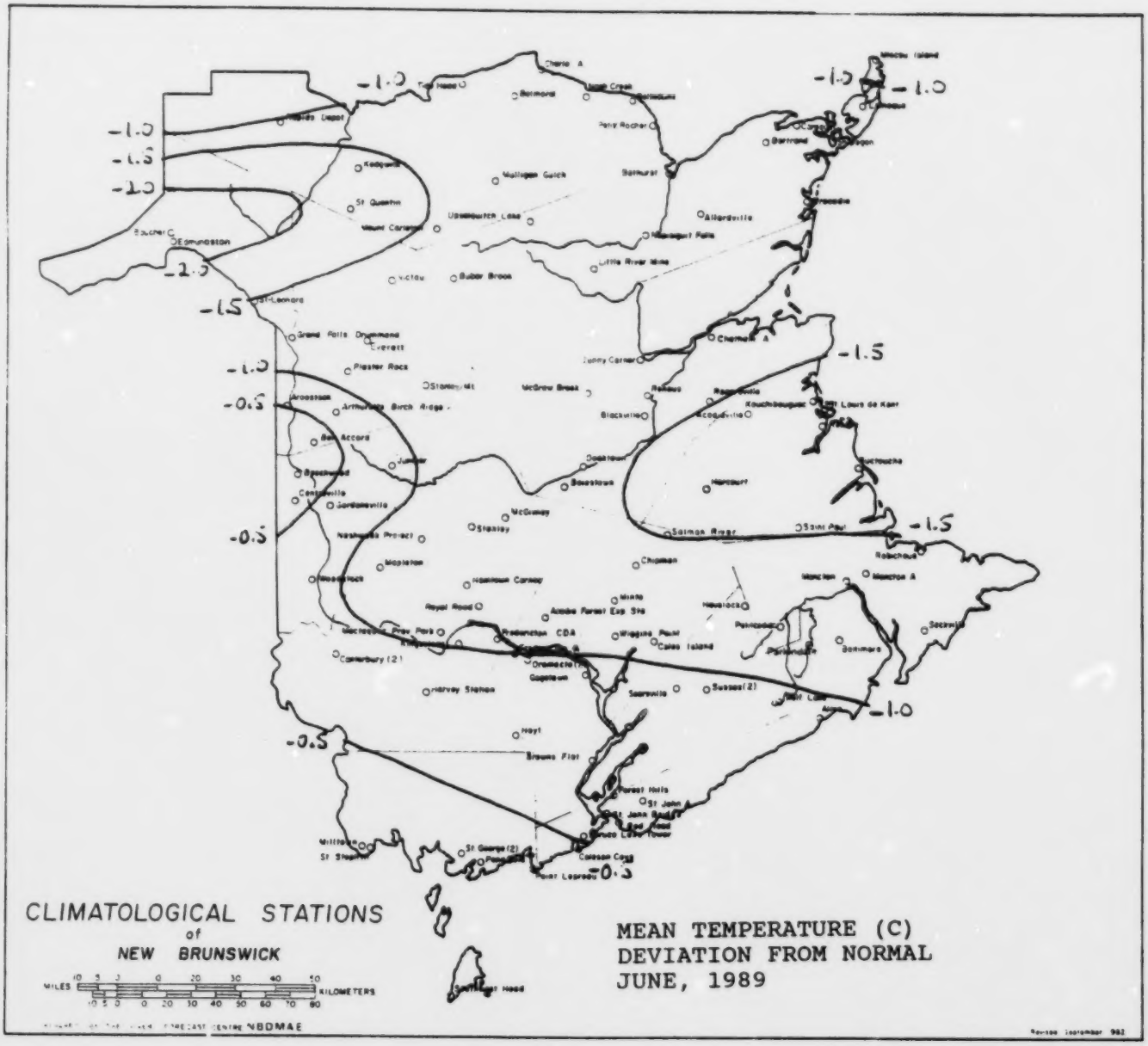


TOTAL PRECIPITATION (MM)
PERCENT OF NORMAL
JUNE, 1989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CLIMATOLOGICAL STATIONS
of
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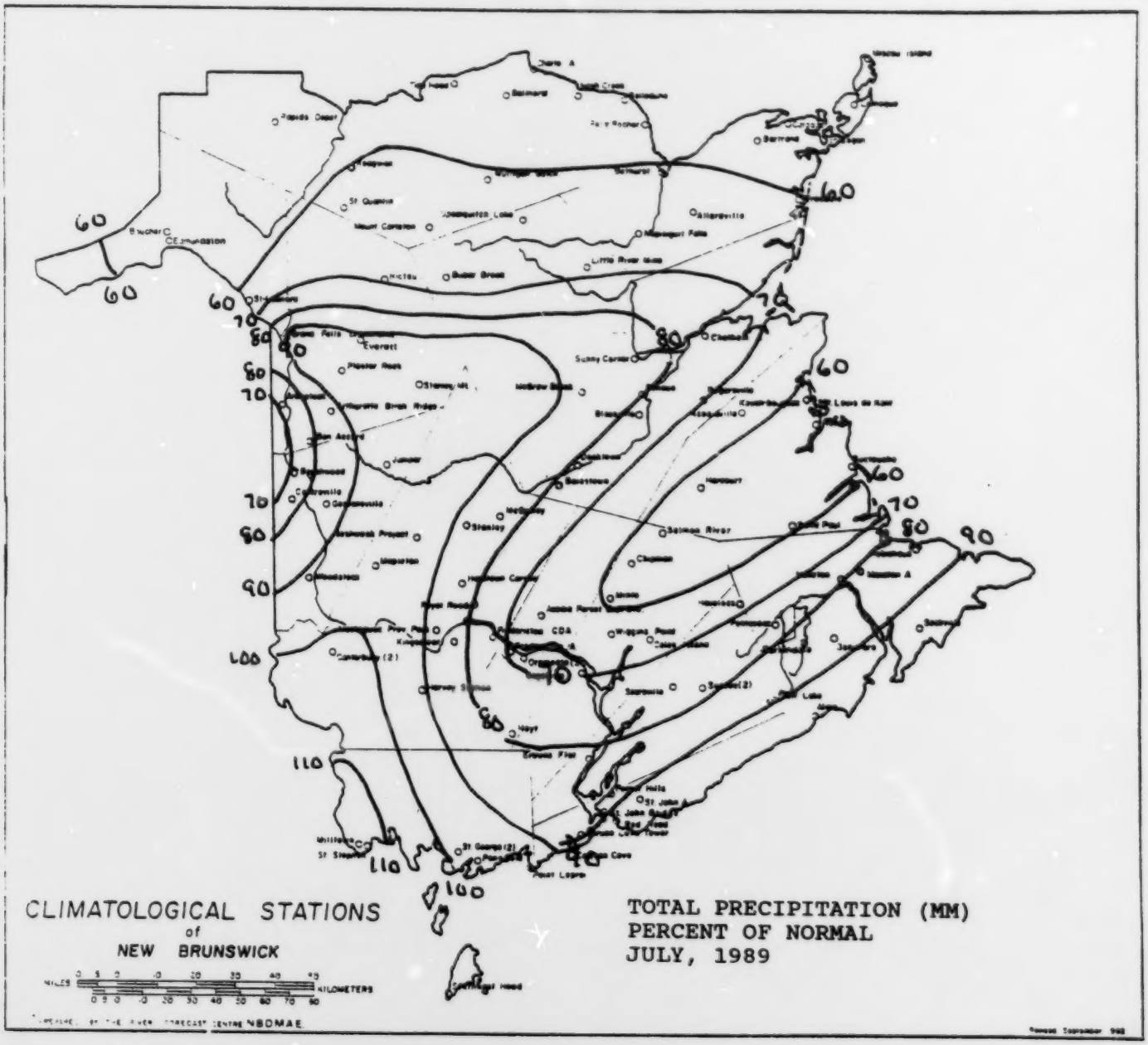
MILES
KILOMETERS
MEAN TEMPERATURE (C)
DEVIATION FROM NORMAL
JUNE, 1989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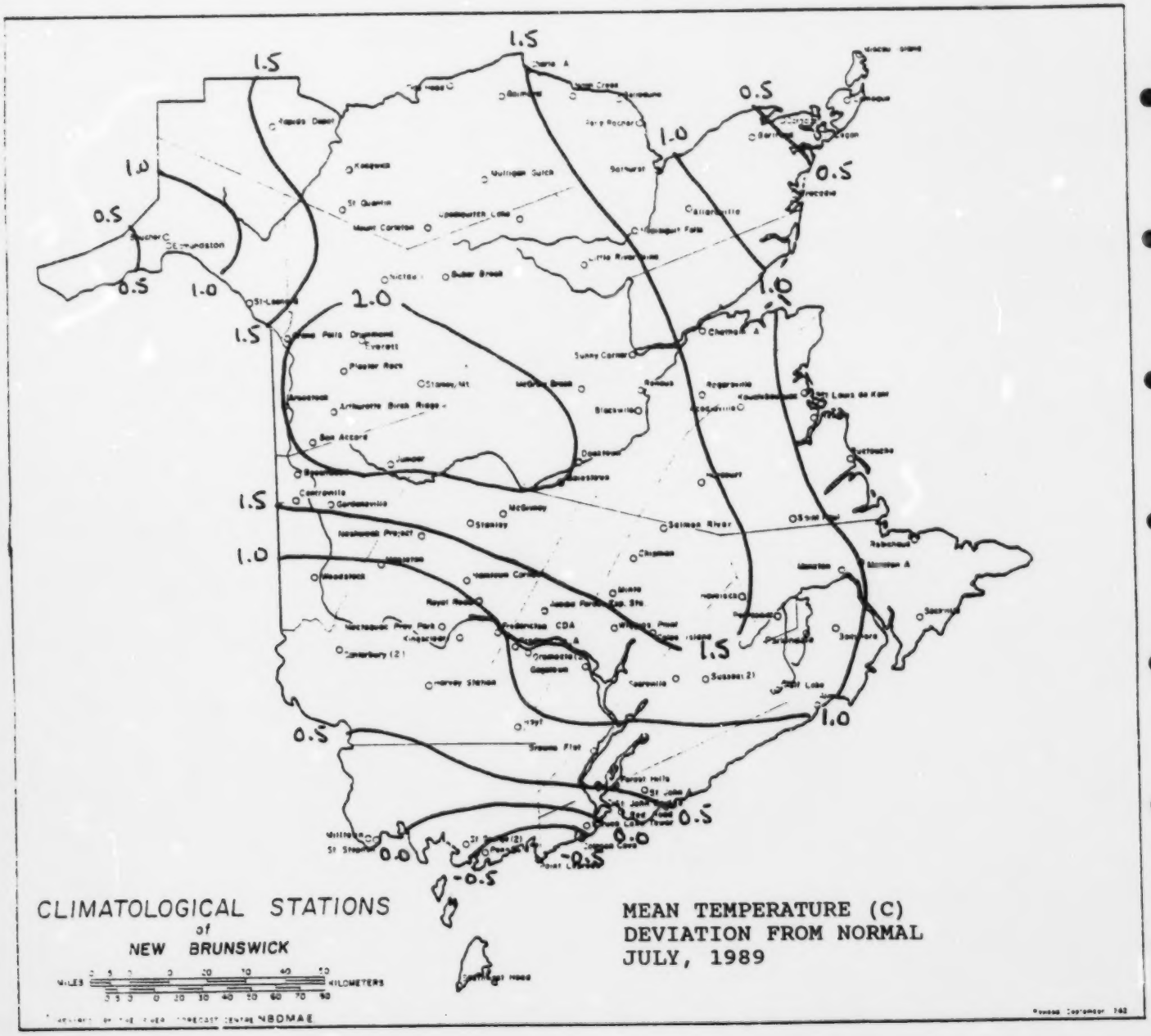
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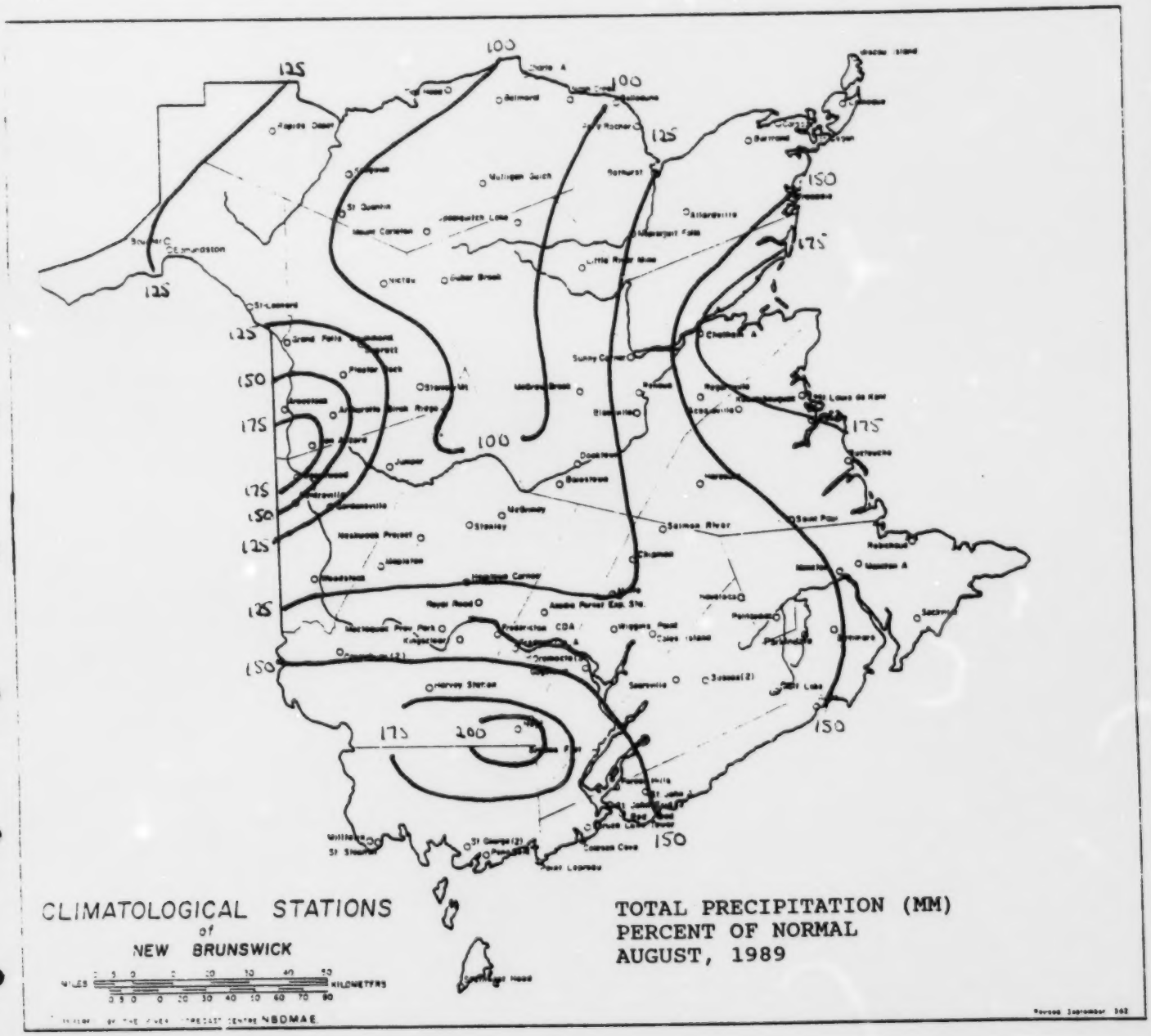
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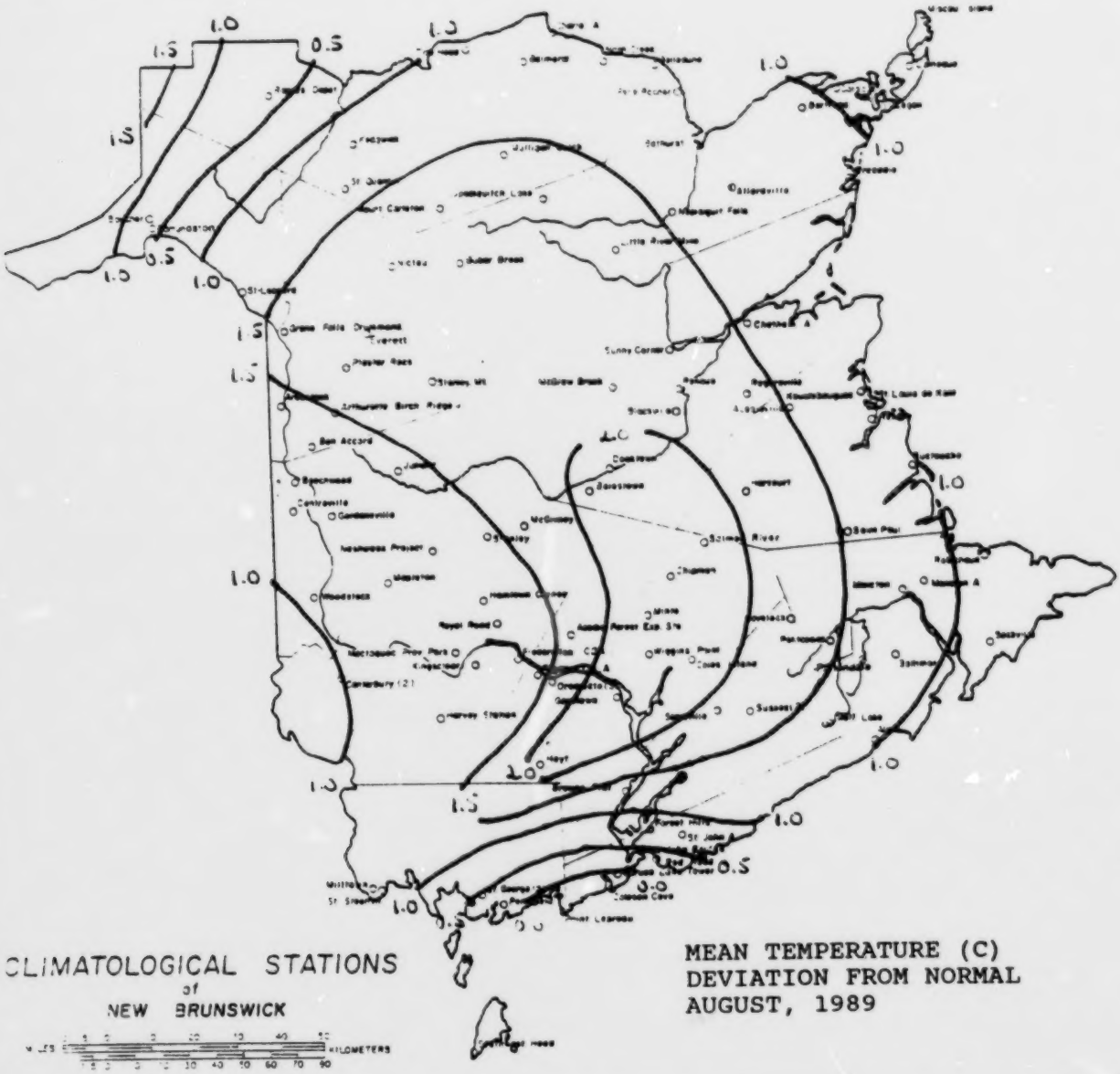
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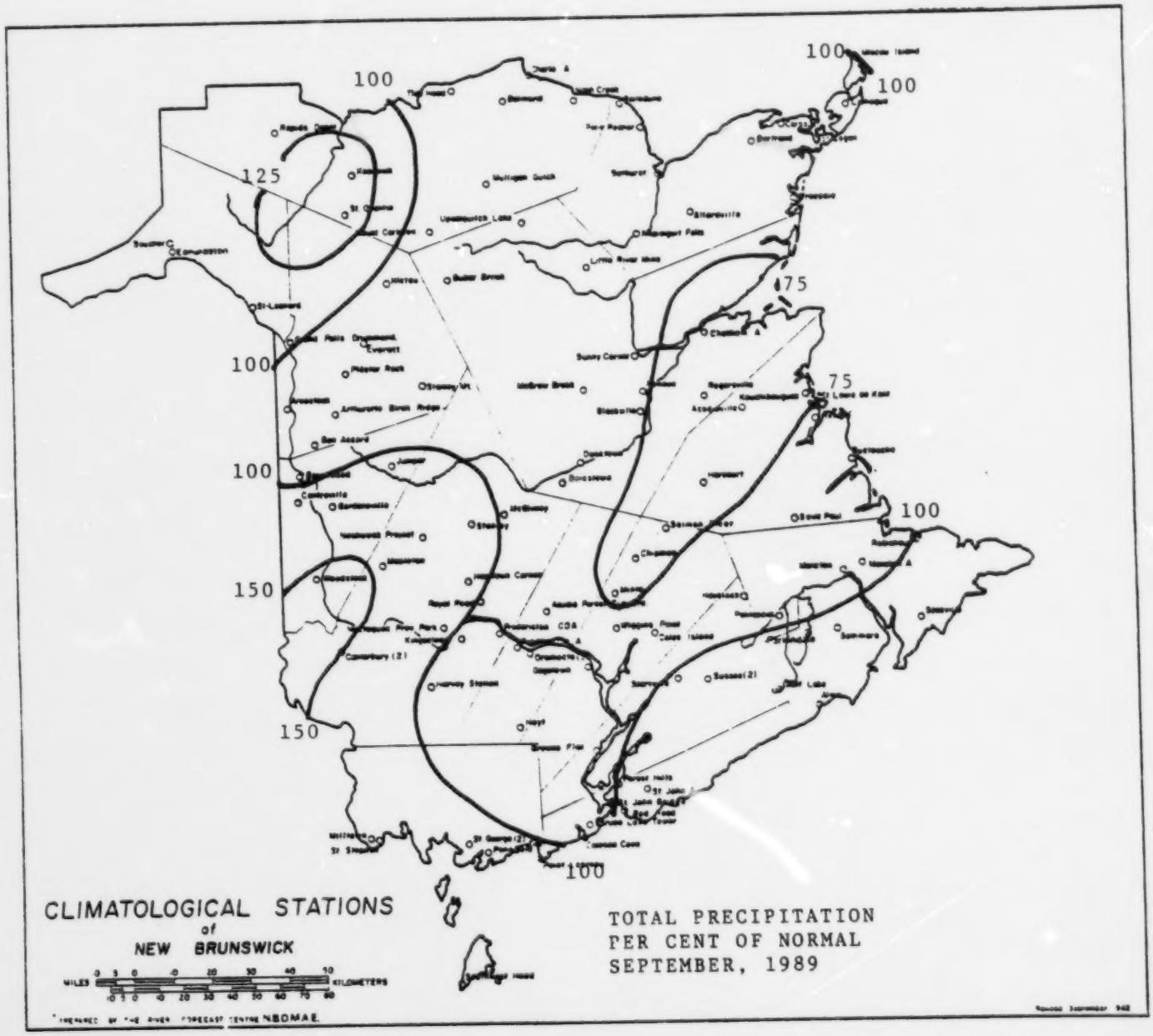
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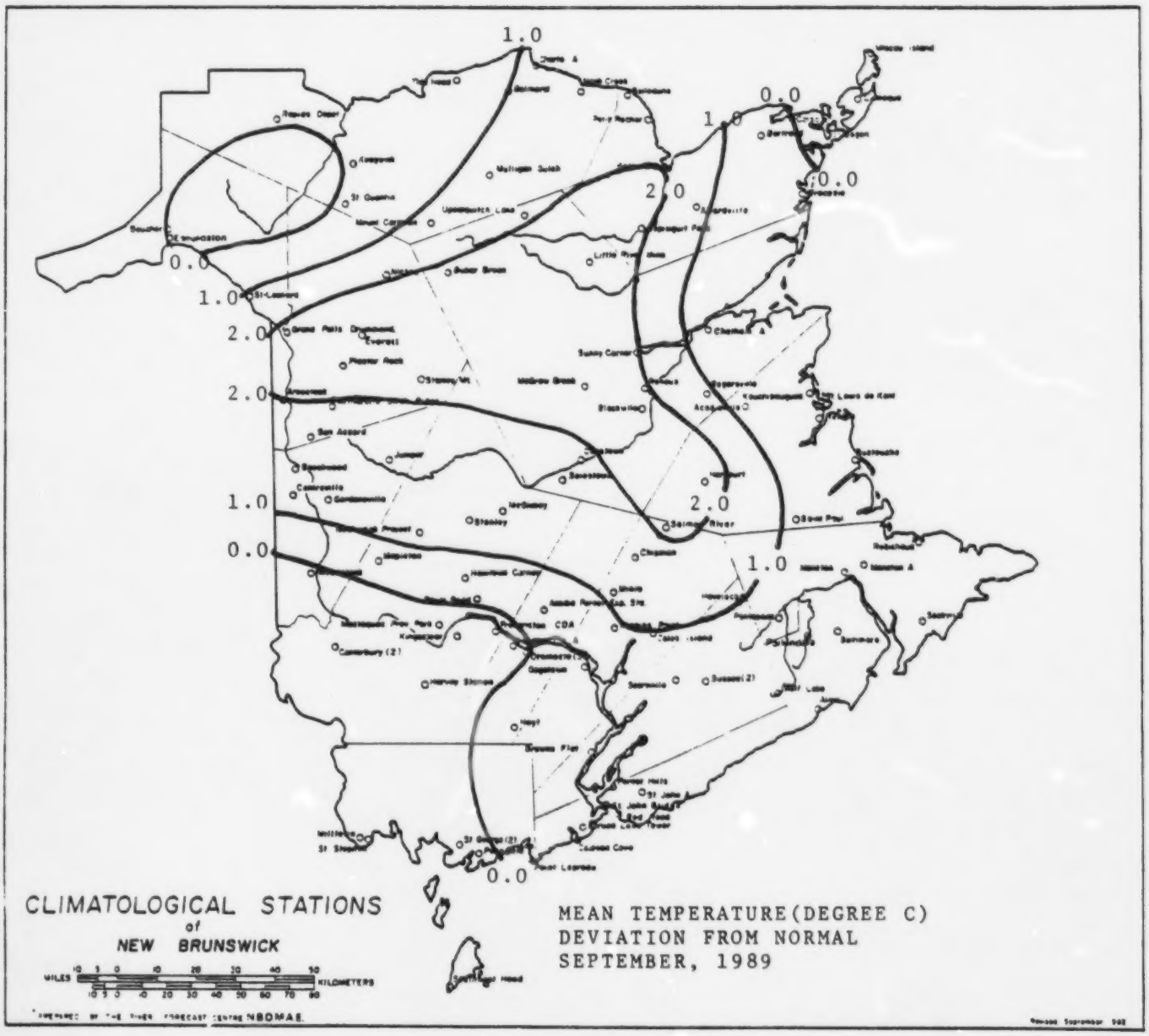
SEPTEMBER, 1989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CLIMATOLOGICAL STATIONS
of
NEW BRUNSWICK
MILES
KILOMETERS
MEAN TEMPERATURE(DEGREE C)
DEVIATION FROM NORMAL
SEPTEMBER, 1989

EFFECT OF GYPSUM ON YIELD AND SCAB INCIDENCE IN THE POTATO CULTIVAR KENNEBEC

R.P. Hinds and A.F. Perley

ABSTRACT: Kennebec potato cultivar (scab-susceptible) was planted on the Holmesville soil series (pH 5.0) naturally infested with common scab (Streptomyces scabies). Plots were top-dressed, post-planting with 0, 336, 672, 1008 kg/ha of gypsum in an RCBD. Total yield was unaffected by gypsum. However, the 672 kg/ha treatment produced better yields of tubers in the size range >60mm compared to other treatments and significantly so over the 336 kg/ha treatment. Though not significant, gypsum reduced scab incidence but no relationship was observed between scab reduction and a lowering of periderm tuber %Ca. Tuber periderm %Ca was the same in all treatments, due in part to the periderm removal method and sample amount for analysis. Leaflet %Ca was also unaffected by the treatments. Gypsum increased Ca levels in the soil by up to 50% in the highest gypsum treated plots compared to the control. Specific gravity and french fry color was unaffected by the treatments though sucrose levels were higher in all the gypsum plots though not to the extent to be detrimental to fry color.

EFFET DU GYPSE SUR LE RENDEMENT DU CULTIVAR DE POMMES DE TERRE KENNEBEC ET SUR LA FRÉQUENCE DES CAS DE GALE

Résumé: Des cultivars de pommes de terre Kennebec (sensibles à la gale) ont été plantés dans des sols de type Holmesville (pH de 5) naturellement infestés par la gale commune (Streptomyces scabies). On a répandu du gypse sur les parcelles d'essai d'un dispositif expérimental en bloc divisé au hasard à raison de 0, 336, 672 et 1 008 kg/ha après la plantation. Le rendement total n'a pas varié avec le gypse. Toutefois, les parcelles traitées à raison de 672 kg/ha ont produit plus de tubercules mesurant >60 mm de diamètre que les parcelles soumises aux autres traitements, principalement celles ayant reçu une dose de 336 kg de gypse à l'hectare. On a noté une réduction peu importante de la fréquence des cas de gale, mais l'on n'a pu établir de rapport entre la réduction de la gale et la diminution du taux de calcium dans la pelure des tubercules. La teneur en calcium de la pelure était uniforme pour tous les traitements, en partie à cause de la méthode utilisée pour prélever la pelure et de la quantité de pelure analysée. Le taux de calcium dans les feuilles n'a pas été modifié par les traitements. Le gypse a eu pour effet d'augmenter jusqu'à 50 % le taux de calcium dans le sol des parcelles traitées avec les plus fortes doses de gypse, comparativement aux parcelles témoins. La densité relative et la couleur des frites n'ont pas été modifiées par les traitements et, même si le taux de sucrose était plus élevé dans toutes les parcelles traitées au gypse, il ne l'était pas assez pour modifier la couleur des frites.

METHOD: Plots on the Holmesville clay loam soil series with a known history of scab were selected for the study. The soil tested low for Ca level (800-1000 kg/ha - Ca) under NB standards. pH levels ranged from 5.0-5.4 at time of planting. Cut seed of Kennebec was used. Intra-row spacing was 20 cm and inter-row spacing was 90 cm.

Gypsum was applied topdressed prior to any cultivations at the rate of 0, 336, 672 and 1008 kg/ha. Cultivations and hilling allowed the gypsum to remain in the hill where the tubers were to develop.

An RCBD was employed.

Soil analyses were done prior to planting and at 8 weeks post-planting - the latter being the period of tuber initiation and early tuber development. Tuber periderm %Ca was determined by peeling the tubers with a carrot peeler and analyzing the peel.

Plot size was 55.8m^2. Gypsum used contained 22% Ca and 16% S. Scab ratings were done on the basis of the key (Can. Plant Dis. Surv. 51: 1971).

Conditions during the period of tuber initiation and development were highly conducive to scab development as moisture was limiting as a result of a drought during July, when rainfall was 50% of normal.

The crop was harvested September 12, 1989.

RESULTS: Soil Analyses: Mean soil analysis results for the treatments are given in Table 1. The soil was acid and tested low for Ca. Hinds and Ghanem (1983) in previous work found that pH had little effect on scab incidence as infection occurred at low, medium and high pH. Gypsum has clearly increased Ca level of the soil (up to 50% higher at the highest gypsum level) and is an excellent source of Ca. This was an ideal soil to test for scab incidence with a scab-susceptible cultivar like Kennebec.

TABLE 1: MEAN SOIL ANALYSIS AT FOUR LEVELS OF GYPSUM APPLICATION ON KENNEBEC POTATO CULTIVAR - 8 WEEKS POST GYPSUM APPLICATION

TREATMENT	Soil Analysis*					
	pH	O.M. %	P_2O_5 kg/ha	K_2O kg/ha	Ca kg/ha	Mg kg/ha
1. 0 kg/ha Gypsum	5.5 **(4.8)**	3.2 **(2.8)**	513+ **(513+)**	368 **(430+)**	881 **(596)**	110 **(62)**
2. 336 kg/ha Gypsum	5.4 **(5.0)**	3.3 **(3.3)**	513+ **(513+)**	276 **(430+)**	952 **(901)**	101 **(118)**
3. 672 kg/ha Gypsum	5.5 **(5.1)**	2.9 **(3.2)**	513+ **(513+)**	323 **(430+)**	1146 **(894)**	116 **(102)**
4. 1008 kg/ha Gypsum	5.5 **(5.1)**	3.4 **(3.1)**	513+ **(513+)**	283 **(430+)**	1331 **(853)**	104 **(105)**

* **Bracketed figures are values pre-planting.**

YIELD: Table 2 shows yield data for gypsum treated plots. There were no differences in total yield between the control and the gypsum treatments. The 672 kg/ha gypsum treatments produced a higher yield of tubers >60mm in size than all the other treatments but was significantly better than the 336 kg/ha treated plot. These oversize (>60mm in size) tubers of Kennebec are

usually sold at a premium price. As in the previous study with Shepody 672 kg/ha gypsum appears to be about the minimum to be applied.

TABLE 2: YIELD OF KENNEBEC AS AFFECTED BY FOUR LEVELS OF GYPSUM

TREATMENT	Yield t/ha			
	<30mm	30-60mm	>60mm	TOTAL
1. 0 kg/ha Gypsum	1.83^{A}	24.60^{A}	11.18^{AB}	37.60^{A}
2. 336 kg/ha Gypsum	2.44^{A}	25.82^{A}	8.94^{B}	37.20^{A}
3. 672 kg/ha Gypsum	1.83^{A}	21.75^{A}	14.03^{A}	37.60^{A}
4. 1008 kg/ha Gypsum	1.83^{A}	24.19^{A}	12.50^{AB}	38.52^{A}

Duncan's Multiple Range Test - 0.05 level. Means with the same letter are not significantly different from each other.

Scab Incidence and Tuber Periderm Ca%: Table 3 shows data on scab incidence and tuber periderm %Ca in Kennebec as affected by four levels of gypsum. All gypsum treatments produced a higher yield of potatoes with little or no scab and a correspondingly smaller yield of tubers with high levels of scab than the control. Gypsum has been beneficial in scab reduction, and earlier skin development in gypsum treated plots compared to the control, was observed. A lower %Ca in the periderm associated with scab reduction as suggested by Davis et al (1976) was not observed. Tuber %Ca was virtually the same in all the treatments, due in part to the method of removal of the periderm and sample amount for analysis. Leaflet %Ca seems to have been unaffected by gypsum application (Table 4) as was shown by Simmons and Kelling (1987).

TABLE 3: SCAB INCIDENCE AND TUBER PERIDERM % CA IN KENNEBEC AS AFFECTED BY FOUR LEVELS OF GYPSUM

TREATMENT	TUBER % Ca	YIELD t/ha	
		TUBER % COVERED WITH SCAB LESIONS	
		0 - 10%	> 10%*
1. 0 kg/ha Gypsum	0.01	34.87[A]	2.74[A] (7.3%)
2. 336 kg/ha Gypsum	0.01	36.35[A]	0.85[A] (2.3%)
3. 672 kg/ha Gypsum	0.01	36.26[A]	1.35[A] (3.6%)
4. 1008 kg/ha Gypsum	0.02	36.30[A]	2.20[A] (5.7%)

Duncan's Multiple Range Test 0 0.05 level. Means with the same letter are not significantly different from each other in the same group.

* Not acceptable by the Trade. Figures in brackets represent % of total yield.

TABLE 4: MEAN LEAF AND TUBER PERIDERM ANALYSES OF SHEPODY POTATO CULTIVAR AS AFFECTED BY FOUR LEVELS OF GYPSUM

TREATMENT	PLANT PART TESTED	%					ppm				
		N	P	K	Ca	Mg	Zn	B	Cu	Mn	Fe
1. 0 kg/ha Gypsum	Leaf*	6.05	0.49	3.07	0.70	0.44	33	17	24	90	93
	Tuber Periderm	1.38	0.23	2.28	0.01	0.07	15	7	8	7	212
2. 336 kg/ha Gypsum	Leaf	6.04	0.51	2.96	0.65	0.42	34	17	23	76	90
	Tuber Periderm	1.44	2.24	2.45	0.01	0.08	15	7	8	8	225
3. 672 kg/ha Gypsum	Leaf	6.10	0.52	2.71	0.63	0.40	41	15	22	83	82
	Tuber Periderm	1.46	0.24	2.45	0.01	0.07	15	6	9	7	179
4. 1008 kg/ha Gypsum	Leaf	6.00	0.52	2.60	0.65	0.43	42	14	22	83	87
	Tuber Periderm	1.55	0.25	2.37	0.02	0.08	15	6	9	8	224

* Mid-season for leaf and petiole and tuber periderm at harvest.

Specific Gravity, French Fry color and Sucrose Content: Gypsum treatments had no significant effect upon specific gravity and french fry color in Kennebec (Table 5). Gypsum treatments did produce a slightly higher sucrose content and the 336 kg/ha treatment was significantly higher than the control. These values, however, did not affect french fry color of the crop out of the field. This is a seed crop where color is not a factor, but were it for processing, careful attention would have been needed if the crop was to be stored for a protracted period prior to processing.

TABLE 5: MEAN TUBER SPECIFIC GRAVITY, FRENCH FRY COLOR AND SUCROSE CONTENT OF KENNEBEC AS AFFECTED BY FOUR LEVELS OF GYPSUM

TREATMENT	MEAN TUBER SPECIFIC GRAVITY	MEAN FRENCH FRY COLOR-MEAN U.S.D.A. EQUIVALENT*	MEAN SUCROSE CONTENT - mg/g
1. 0 kg/ha Gypsum	1.068	1.0	1.10^{B}
2. 336 kg/ha Gypsum	1.064	1.1	1.89^{A}
3. 672 kg/ha Gypsum	1.066	1.1	1.33^{AB}
4. 1008 kg/ha Gypsum	1.065	1.0	1.61^{AB}

* U.S.D.A. color of 1-4 is acceptable for french fry trade. Higher numbers correspond to worsening of color.

CONCLUSIONS: Total yield was unaffected by gypsum application but yield of tubers >60mm in size was higher in gypsum plots, with the 672 kg/ha plots being significantly better than the 336 kg/ha gypsum application. In Kennebec, oversize tubers generally carry a premium price in some market niches. Gypsum resulted in a reduction in scab incidence compared to the control but no relationship to periderm tuber %Ca was observed. Leaflet %Ca was unaffected by application of gypsum. Specific gravity and french fry color was unaffected by gypsum but sucrose content was higher under gypsum than the control, though this did not affect french fry color.

Gypsum increased soil Ca levels by up to 50% at the highest level 1008 kg/ha over the control.

ACKNOWLEDGEMENTS: The authors respectfully acknowledge the efforts of B. Jepperson during the period the work was undertaken.

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GREEN MANURE - GYPSUM EFFECTS ON YIELD AND SCAB INCIDENCE IN THE POTATO CULTIVAR SHEPODY

R.P. HINDS AND A.F. PERLEY

ABSTRACT: Several green manure strips were established in 1989 at two locations on the Holmesville clay loam soil series with a history of common scab caused by streptomyces scabies. The strips were chopped and plowed down in the fall. Imposed on the strips in a split plot design in 1991 will be 4 levels of gypsum: 0, 672, 1344 and 2016 kg/ha, to investigate the effects of gypsum on yield and scab incidence in the scab-susceptible potato cultivar Shepody, in the absence of irrigation. This study is intended to develop in the absence of appropriate varietal resistance, an integrated disease management program, that is an effective way to achieve adequate disease reduction under N.B. conditions.

EFFET DE L'ENGRAIS VERT ET DU GYPSE SUR LE RENDEMENT DES CULTIVARS DE POMMES DE TERRE SHEPODY ET SUR LA FRÉQUENCE DES CAS DE GALE

Résumé: De l'engrais vert a été semé en 1989 sur plusieurs bandes de terrain à deux endroits dans des sols de type Holmesville formés de loam argileux, qui sont habituellement infestés par la gale commune causée par les Streptomyces scabies. Les cultures ont été coupées et enfouies dans le sol à l'automne. En 1991, on appliquera du gypse sur les bandes selon un dispositif expérimental à raison de 0, 672, 1 344 et 2 016 kg/ha, afin d'étudier l'effet du gypse sur le rendement et sur la fréquence des cas de gale dans le cultivar de pommes de terre Shepody qui est sensible à cette maladie. Aucune irrigation ne sera faite. L'étude, qui est réalisée en l'absence d'une résistance variétale appropriée, a pour but de mettre au point un programme complet de lutte contre la maladie et représente un moyen efficace de réduire suffisamment la fréquence de la maladie dans les conditions qui prévalent au Nouveau-Brunswick.

METHOD: Strips of green manure crops were established as shown in Figures 1 and 2 at two locations on the Holmesville clay loam soil series, naturally infested with the common scab, Streptomyces scabies. Fertilizer at the rate of 336 kg/ha of a blended 19-9-18 was applied at the time of planting on all treatments. Planting was completed on June 6 at one location and June 5 at another.

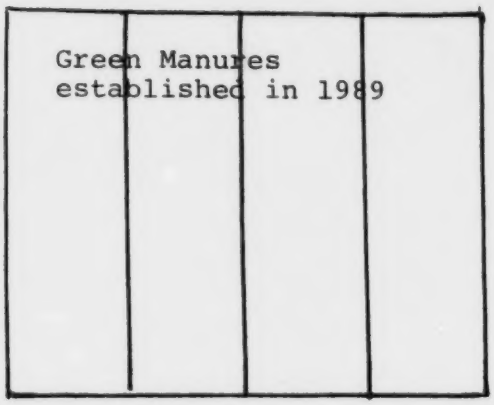
The strips were chopped on August 10, and fall plowed. Dry matter additions to the soil prior to chopping was estimated by random selection of 3 foot square portions of vegetation. Shepody potato cultivar (scab-susceptible) will be planted in 1990 on all strips and gypsum at the rate of 0, 672, 1344 and 2016 kg/ha will be imposed upon each strip in a split plot design. Data to be collected over the next three years include:

- O.M. %
- Dry matter incorporated
- Moisture required during growth
- Soil and petiole analyses
- Scab incidence (tuber area % covered with lesions)
- Hollow heart
- Yield (quantity and quality)
- Tuber periderm % Ca
- Specific gravity, sucrose and french fry color

RESULTS: Results will be reported between 1990-1991.

LOCATION I

Green Manure/Gypsum Effects on yield and Scab Incidence in Shepody Potato Cultivar - Holmesville Soil Series
Split Plot Design - Four replications



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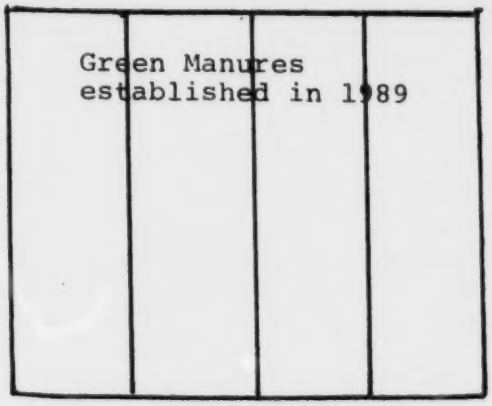

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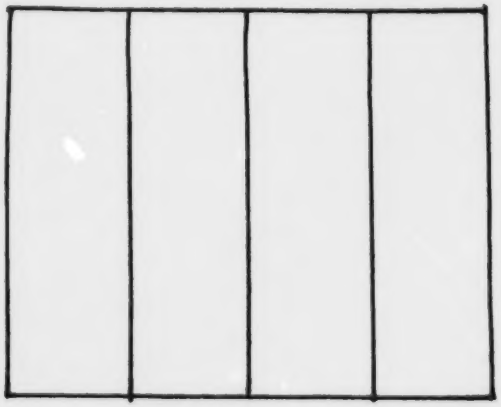

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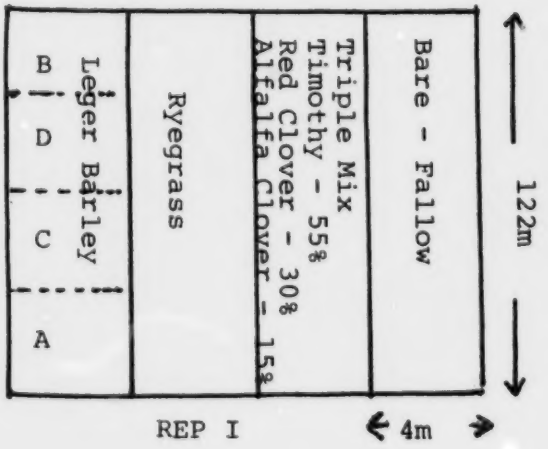
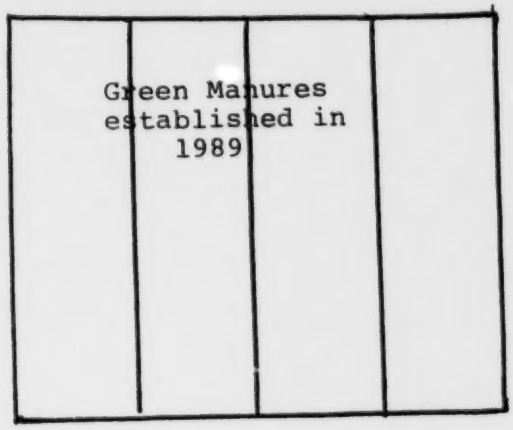


REP I

A - 0 kg/ha Gypsum]
B - 672 kg/ha Gypsum] to be applied
C - 1344 kg/ha Gypsum] in 1990
D - 2016 kg/ha Gypsum]

LOCATION II

Green Manure/Gypsum Effects on Yield and Scab Incidence in the Potato Cultivar Shepody.
Holmesville Soil Series - Location II
Split Plot Design - Four Replications



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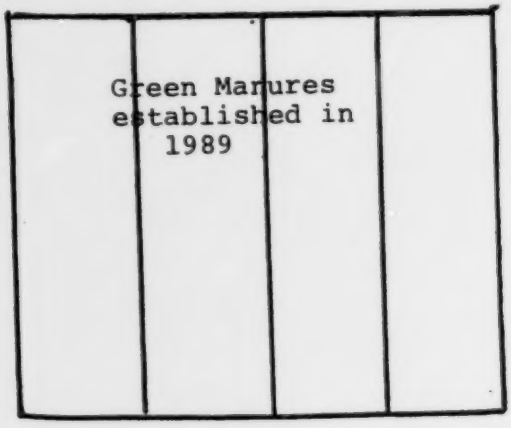

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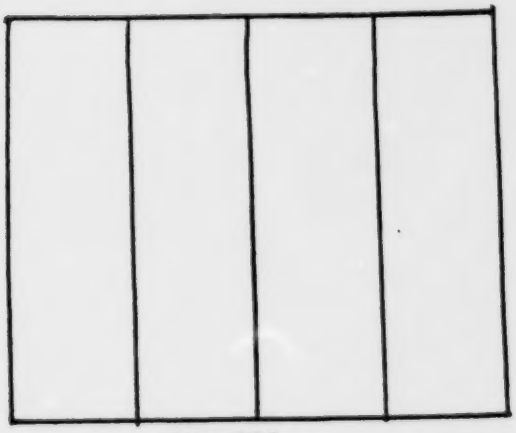

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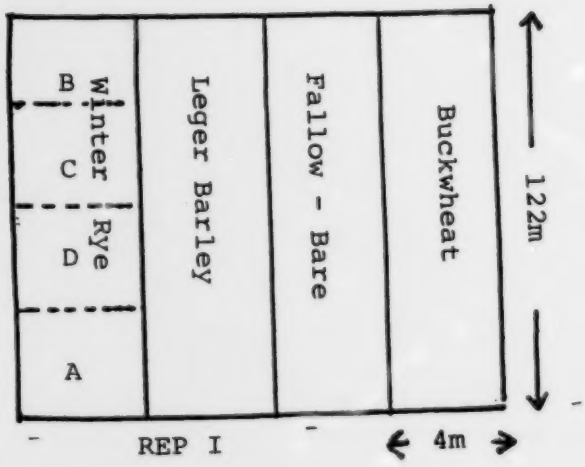

REP I

A - 0 kg/ha Gypsum]
B - 672 kg/ha Gypsum] to be applied
C - 1344 kg/ha Gypsum] in 1990
D - 2016 kg/ha Gypsum]

FIELD OBSERVATIONS ON THE RUMPTSTAD FOUR-ROW RIDGE SHAPER VERSUS CONVENTIONAL HILLING IN THE PRODUCTION OF RUSSET BURBANK POTATO CULTIVAR

R. P. Hinds

ABSTRACT: Field observations on the production of Russet Burbank potato cultivar using a Rumptstad 4-row ridger versus conventional hilling, were determined on the Caribou Clay loam soil series. The Rumptstad ridger buried the seed pieces under 15 cm of soil. Emergence was delayed, growth was reduced and weed control was poor under the Rumptstad ridges. There was a 35% decrease in total yield under the Rumptstad ridges which also produced a greater percentage of off-type and oversize tubers. Marketable yield under the Rumptstad ridges was 26.81 t/ha versus 45.47 t/ha under conventional hilling. Conventional hilling produced better quality potatoes in terms of both specific gravity and french fry color.

OBSERVATIONS SUR L'UTILISATION D'UNE CHARRUE BUTTEUSE RUMPTSTAD À 4 BUTTEURS ET D'UNE MÉTHODE CONVENTIONNELLE DE BUTTAGE POUR LA PRODUCTION DE CULTIVARS DE POMMES DE TERRE RUSSET BURBANK

Résumé: Des observations au champ relatives à la production de cultivars de pommes de terre Russet Burbank ont été faites dans des sols de type Caribou formés de loam argileux pour comparer l'utilisation d'une charrue butteuse Rumptstad à quatre butteurs par rapport à une méthode conventionnelle de buttage. Avec la charrue butteuse Rumptstad, les morceaux de semence étaient enterrés sous 15 cm de terre. La levée fut retardée, la croissance fut réduite et la répression des mauvaises herbes n'a pas été bonne sur les parcelles buttées avec la Rumptstad. On a noté que cette machine avait entrainé une baisse de 35 % du rendement total et une augmention de la proportion des pommes de terre hors type et des pommes de terre trop grosses. Le rendement de pommes de terre commercialisables était de 26,81 t/ha avec la Rumptstad et de 45,47 t/ha avec la méthode conventionnelle de buttage. Le buttage conventionnel a produit des pommes de terre de meilleure qualité en termes de densité relative et de couleur des frites.

INTRODUCTION: Over the years, potato production in N.B. in general, incorporated at least one cultivation and two hilling operations to effect the width and height of hills considered necessary for tuber development. Technologies from other potato growing areas, have been evaluated in the past with varying success, but in recent years the Rumptstad Ridge shaper from Holland has received serious consideration. The Rumptstad 4-row ridge shaper retails for about $20,000 (Can.) and reports from potato growers have indicated that the ridger can work in shallow soils, and is ideal for cloddy soils. Because of the need for P.T.O. attachment, the operation of ridging is slow and reports of yields vary from less than average to average over the past two years. N.B. potato soils are stony and where there are excessive stones, operation of the ridges becomes difficult. As a consequence of the foregoing, it was decided to examine the use of the equipment on a very good potato farm on a field scale up to 20 acres compared to conventional hilling methods for the crops.

EQUIPMENT AND METHODS: The Rumptstad 4-row ridger used, effectively made 4 rows, 36 inches (91.5 cm) apart (Figure 1). The ridgers are adjustable in both the

horizontal and vertical directions. Three complete ridgers are used with two halves on the outside creating 4 completed ridges. The equipment is P.T.O.

Figure 1: Ridge Shaping

driven and adjustments in height are made by means of a screw-type adjuster. Conventional hilling equipment consists of a tool bar with tines in front and ridgers at the back which allow for 2 complete ridges in the center and 2 half-ridges on the outside which are completed in the next run. Conventional hilling equipment is center mounted or rear-mounted but not P.T.O. driven.

Two fields on the Caribou clay loam soils series were treated. The rotation sequence for the fields was potatoes, grain (underseeded to clover). Clover was kept for one full year.

After planting and weed control with Metribuzin (standard treatment), 20 acres of Russet Burbank potato cultivar were ridged with the Rumptstad 4-row ridger. Twenty acres were left and cultivated and hilled in the conventional manner prior to full bloom.

The crop was planted on May 20th and harvested on Oct. 14, 1989. Tuberisation occurred around July 4, 1989. Hilling was completed by June 30, 1989. Rainfall in July was 50% of normal. Fertilizer was 1120 kg/ha 15-15-15.

RESULTS: Emergence and Growth: Emergence was 8-10 days later under the Rumptstad 4-row ridges, which had buried the seed pieces under 6 inches (15 cm) of soil. In addition, the young plants emerged everywhere on the hill. Some plants came through the left side, some through the top and some through the right side of the hill. It looked an awful mess. The grower's mental anguish was compounded when the Rumptstad ridged field was overrun with weeds - Lamb's Quarters (Chenopodium

album L.). Leger barley and Lady's Thumb (Polygonum persicaria L.).

This necessitated a second application of herbicide which failed to give complete control. As a result, the Rumptstad ridges were covered with weeds right up to harvest even after an attempt at mechanical cultivation. On July 25, 1989, an examination of hills was carried out to determine tuber number and size. Under the Rumptstad ridges, there were 6-8 tubers/hill with a mean diameter of 2.54 cm (1 inch). Under the conventional hills, there were 14-16 tubers/hill with a mean diameter of 5 cm (2 inches).

YIELD: Table 1 shows the yields of the Rumptstad ridges versus conventional hilling. Conventional hilling produced total yields which were 35% greater than the Rumptstad ridges. The dense stand of weeds under the Rumptstad ridges would, from past experience, have accounted for at least 30% of the 38%, which means that conventional hilling produced a total yield which, had weeds been absent, would be 8% greater than the Rumptstad ridges. The Rumptstad ridges produced a greater tonnage of roughs and off type tubers as well as very large tubers (> 10 oz. or 283 g) than conventional hilling. Conventional hilling produced a greater yield of small tubers (< 3 ozs. or 84 g).

Marketable yield (3 - > 10 ozs. or 84 - > 283 g) under the Rumptstad was 26.81 t/ha versus 45.47 t/ha under conventional hilling.

TABLE 1: COMPARISON OF YIELDS OF THE RUMPSTAD 4-ROW RIDGE SHAPER VERSUS CONVENTIONAL HILLING IN RUSSET BURBANK POTATO CULTIVAR ON THE CARIBOU SOIL SERIES

Treatment		Yield t/ha				
		< 2 ozs. (< 56 g)	2-10 ozs. (56-283 g)	> 10 ozs. (> 283 g)	Off-Type	Total
1.	Rumptstad 4-row ridge shaper for hilling at planting	4.5	19.09	7.72	2.43	33.74
2.	Conventional Hilling Post Planting	9.0	41.41	4.06	0.0	54.47

Specific Gravity, French Fry Color and Sucrose Content: Table 2 shows a comparison of specific gravity, french fry color and sucrose content under the Rumptstad and conventional hilling. Conventional hilling produced tubers with a higher specific gravity and slightly better color than the Rumptstad ridges. Sucrose content was slightly better under the Rumptstad ridges than conventional hilling.

TABLE 2: COMPARISON OF SPECIFIC GRAVITY, FRENCH FRY COLOR AND SUCROSE CONTENTS OF THE RUMPSTAD 4-ROW RIDGE SHAPER VERSUS CONVENTIONAL HILLING IN RUSSET BURBANK POTATO CULTIVAR ON THE CARIBOU SOIL SERIES

	TREATMENT	Specific Gravity	French Fry * Color U.S.D.A. Equivalent	Sucrose Content mg/g
1.	Rumptstad 4-row Ridge shaper	1.072	1.4	0.82
2.	Conventional Hilling	1.083	1.2	1.06

U.S.D.A. color 1-4 is acceptable for french fry trade - Higher values indicate worsening of color.

CONCLUSION: Emergence was delayed and growth was reduced in Russet Burbank potato cultivar with the Rumptstad 4-row ridger compared with conventional hilling. Weed control was poor under the Rumptstad ridges. Tuber set and yield were also reduced under the Rumptstad ridges. Conventional hilling produced yields which were 38% greater with higher specific gravity and better french fry color than the Rumptstad ridges. Marketable yield was also greater under conventional hilling.

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EFFECT OF GYPSUM ON YIELD AND SCAB INCIDENCE IN THE POTATO CULTIVAR SHEPODY

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ABSTRACT: Shepody potato cultivar (scab-susceptible) was planted on the Holmesville soil series (pH 6.1) naturally infested with common scab (streptomyces scabies). Plots were top-dressed, post planting, with 0, 672, 1344 and 2016 kg/ha of gypsum in RCBD. Gypsum treatments increased total yield, with the 672 kg/ha treatment being significantly better than the control. Similarly all gypsum treatments reduced the incidence of scab with the 672 kg/ha treatment producing significantly higher yield of tubers with little or no scab (i.e. 0 - 10% of the tuber area covered with lesions) compared to the control. Gypsum treatments had only a very slight decrease in tuber periderm % Ca over the control. Gypsum had no significant effect upon specific gravity, french fry color, sucrose content, hollow heart, stem-end browning or leaf % Ca concentration. This work will continue for two more years.

EFFET DU GYPSE SUR LE RENDEMENT DU CULTIVAR DE POMMES DE TERRE SHEPODY ET SUR LA FRÉQUENCE DES CAS DE GALE

Résumé: Des cultivars de pomme de terre Shepody (sensibles à la gale) ont été plantés dans des sols de type Holmesville (pH de 6,1) naturellement infestés par la gale commune (Streptomyces scabies). On a répandu du gypse sur les parcelles d'essai d'un dispositif expérimental en bloc divisé au hasard à raison de 0, 672, 1 344 et 2 016 kg/ha après la plantation. Les traitements de gypse ont accru le rendement total, et les parcelles traitées avec 672 kg de gypse par hectare ont eu un rendement nettement supérieur à celui des parcelles témoins. De plus, tous les traitements de gypse ont contribué à réduire la fréquence des cas de gale, et les parcelles ayant reçu une dose de 672 kg/ha ont donné de biens meilleurs rendements de tubercules ayant peu ou pas de gale (c.-à-d. que les lésions galeuses couvraient 0 à 10 % du tubercule) que les parcelles témoins. Une très légère diminution du taux de calcium dans la pelure a été notée dans les parcelles ayant subi des traitements au gypse, comparativement aux parcelles témoins. Le gypse n'a pas eu d'effet important sur la densité relative, la couleur des frites, la teneur en sucrose, le coeur creux, le brunissement du talon ou sur la concentration de calcium dans les feuilles. Les essais se poursuivront pendant deux autres années.

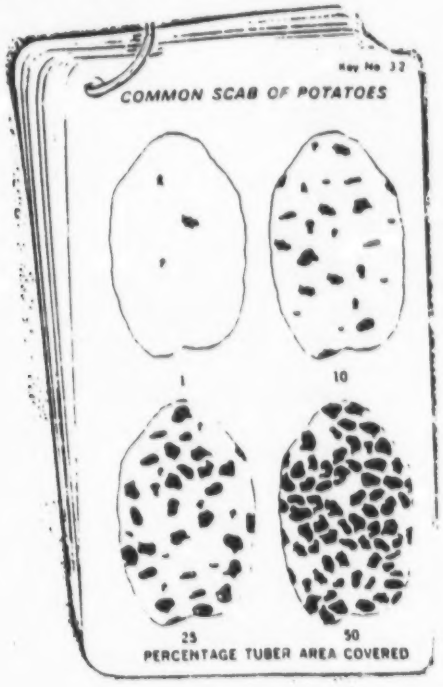
INTRODUCTION: Common scab caused by a gram positive filamentous bacterium Streptomyces scabies is a ubiquitous, well adapted soil inhabitant, that reduces the quality of yield in susceptible potato cultivars. Anderson and Lorang (1988) reported that the disease can be minimized by crop rotations, irrigation, incorporation of green manures, the addition of sulphur in the form of gypsum or sulphur dust or by pentachloronitrobenzine (PCNB). Davis et al. (1976) hypothesized that the effects of various control measures which reduced scab could be explained by the resulting increase in Ca level of the potato plant but this has yet to be verified. Davis et al. (1974) demonstrated that both elemental S and gypsum reduced scab and soil pH when applied to soil, which had a pH of 7.7. However, they indicated that the reduction in soil pH was not sufficient to account for disease suppression. Ca levels in the tuber peelings were found to be lower than in the untreated plots, suggesting that the reduction of the disease was indirect and due to a decrease in Ca in the tuber peelings. Davis et al. (1976) subsequently indicated that the

concentration of Ca in the tuber periderm may be positively correlated with susceptibility to scab. These workers also noted that low soil moisture which increases scab, also resulted in higher Ca concentrations in tuber peelings. Kelman et al. (1989) reported that raising tuber Ca concentration reduces bacterial soft rot susceptibility in potatoes and it was reported that preplant strip application of sieved $CaSO_4$ was shown by other workers, to be one of the best Ca sources for improving tuber grade and quality. On the other hand, it was reported that lime was not an effective application for increasing Ca concentration in potato tubers and quality as sieved $CaSO_4$. Kelman et al. (1989) reported normal Ca in tuber periderm ranges from 0.057 - 0.277%. Simmons and Kelling (1987) found that on low Ca tested soils, gypsum did not affect total potato yield, but increased tuber grade and quality at rates of up to 1500 lbs. gypsum/Ac (300 kg Ca/ha). These improvements were accompanied by increased tuber periderm Ca concentrations, even though leaflet Ca concentrations were unaffected. On high Ca tested soils, responses were inconsistent, and tuber periderm Ca was generally not increased. Kelman et al. (1989) reported that tuber Ca concentration is strongly influenced by Ca concentrations in the hill surrounding the tuber as it develops, and direct movement of Ca into the tuber takes place from the soil either directly though the periderm, or though the stolon and tuber roots. It was found that sieved $CaSo_4$ applied (1500 lbs/ac) either broadcast, in a preplant strip or as a side-dress, were effective in increasing Ca concentration in the tuber. Consequent upon the foregoing, it was decided to examine the effects of gypsum ($CaSo_4 . 2H_20$) applied top-dressed post planting, upon scab incidence, yield and tuber periderm Ca concentration in Shepody, a scab susceptible potato cultivar, over a three year period.

METHOD: Plots on the Holmesville clay loam soil series with a 10-year history of scab were identified for the purpose of this three year study. The soil tested medium for Ca-levels (1200-2000 kg/ha) under NB Standards. Shepody (cut-seed) was planted on May 30th at 25 cm intra-row spacing. Gypsum was applied top-dressed at the rate of 0, 6572, 1344 and 2016 kg/ha. Cultivations and hilling allowed the gypsum to remain in the hill where the tubers were to develop. An RCBD was employed. Soil analyses were taken prior to and 8 weeks post planting in the latter being during the period of initiation and early tuber development. Plot size was 55.8 m^2. Gypsum used was 22% Ca and 16% S. Tuber periderm was rempved with a carrot peeler for analysis.

July, the month of tuber initiation and early development had 50% of normal rainfall. Conditions were highly

conducive to scab development. Scab was determined as per the key below (Can. Plant Dis. Surv. 51: 1971).



RESULTS: Soil Analysis: Mean soil analyses results for the treatments are given in Table 1. From a fertility status, the soil was ideal for growing potatoes under N.B. conditions.

TABLE 1: Mean Soil Analysis at Four Levels of Gypsum Application on Shepody Potato Cultivar - 8 weeks past Gypsum Application.

TREATMENT	Soil Analysis					
	pH	O.M. %	P_2O^3 kg/ha	K_2O kg/ha	Ca kg/ha	Mg kg/ha
1. 0 kg/ha gypsum	6.1	3.4	513+	374	1801	228
2. 672 kg/ha "	6.1	3.0	513+	361	1512	214
3. 1344 kg/ha "	6.1	3.5	513+	371	1844	230
4. 2016 kg/ha "	6.1	2.9	513+	427	1509	211

The soil tested medium for Ca and there are only minor soil differences between plots.

YIELD: Table 2 shows yield data for the four rates of gypsum application. All gypsum treatments produced a better total yield than where no gypsum was applied. The treatment with 672 kg/ha gypsum produced significantly better total yields than the control and produced equivalent yield to the higher rates of gypsum applications. There were no significant differences between yields of the various size classes.

TABLE 2: YIELD OF SHEPODY AS AFFECTED BY FOUR LEVELS OF GYPSUM

TREATMENT	Yield t/ha			
	<30mm	30-60mm	>60mm	Total
1. 0 kg/ha Gypsum	1.22^{A}	18.20^{A}	7.00^{A}	26.43^{B}
2. 672 kg/ha Gypsum	0.90^{A}	20.64^{A}	9.05^{A}	30.59^{A}
3. 1344 kg/ha Gypsum	1.06^{A}	18.04^{A}	9.56^{A}	28.66^{AB}
4. 2016 kg/ha Gypsum	1.01^{A}	16.98^{A}	10.78^{A}	28.77^{AB}

Duncan's Multiple Range Test - 0.05 level. Means with the same letter are not significantly different from each other.

Scab Incidence And Tuber Periderm Ca%: Table 3 gives the data on scab incidence and tuber periderm % Ca in Shepody as affected by four levels of gypsum. All gypsum treatments produced a higher yield of potatoes with little or no scab than the control. Plots treated with 672 kg/ha gypsum produced a significantly higher yield of tubers with little or no scab (0-10% tuber area covered with scab lesions) than the control. Differences between gypsum treatments and scab incidence were similar. An examination of treatments 5 weeks post-tuberisation showed that tubers under the gypsum treatments had a more advanced skin development than the control. It is felt that this earlier skin development may reduce ingress of the pathogen. It is well known that the susceptibility of the host is limited in time (tuber initiation to early tuber development). Keinath and Loria (1989) reported that infection only occurs as the stomates in the immature tubers are transformed into lenticels. Once the lenticels have matured and are completely suberised, the pathogen is unable to gain ingress. Gypsum may be hastening this transformation process. Tuber periderm Ca% was lower but not significantly so by the gypsum treatments. The method of removal of the periderm and sample amount for analysis

may have influenced readings observed. Simmons and Kelling (1987) reported that in higher soil test Ca soils, similar to the one in this trial, responses to gypsum were inconsistent and periderm Ca concentration was generally not increased. Leaflet Ca concentrations (Table 4) were unaffected by gypsum treatments as well. The highest leaflet Ca concentration was observed in the control plots.

TABLE 3: SCAB INCIDENCE AND TUBER PERIDERM % CA IN SHEPODY AS AFFECTED BY FOUR LEVELS OF GYPSUM APPLICATION

TREATMENT	TUBER PERIDERM %Ca	Yield t/ha TUBER AREA% COVERED WITH SCAB LESIONS 0 - 10%	> 10%*
1. 0 kg/ha Gypsum	0.07	26.30[B]	0.14
2. 672 kg/ha Gypsum	0.05	29.92[A]	0.67
3. 1344 kg/ha Gypsum	0.06	28.38[AB]	0.29
4. 2016 kg/ha Gypsum	0.06	28.70[AB]	0.07

Duncan's Multiple Range Test - 0.05 level. Means with the same letter are not significantly different from each other in the same group.
(* Not acceptable by the Trade).

Hollow Heart/Stem-End Browning: Neither stem-end browning nor hollow heart were affected by gypsum application (Table 5).

Specific Gravity, French Fry Color and Sucrose Content: Gypsum treatments had no significant effect upon specific gravity, french fry color or sucrose content (Table 6).

CONCLUSIONS: Gypsum produced a better total yield with the 672 kg/ha gypsum treatment producing a significantly better yield than the control. Gypsum had no significant effect upon the yield of various seed sizes, or upon specific gravity, french fry color, sucrose content, hollow heart or stem-end browning.

All gypsum treatments produced a higher total yield of tubers with little or no scab than the control but the

TABLE 4: MEAN LEAF AND TUBER PERIDERM ANALYSES OF SHEPODY POTATO CULTIVAR AS AFFECTED BY FOUR LEVELS OF GYPSUM

TREATMENT	PLANT PART TESTED	%					ppm				
		N	P	K	Ca	Mg	Zn	B	Cu	Mn	Fe
1. 0 kg/ha Gypsum	Leaf*	4.99	0.45	3.72	1.42	0.63	54	41	33	181	112
	Tuber Periderm	2.02	0.22	2.87	0.07	0.11	16.3	6.8	12	24	138
2. 672 kg/ha Gypsum	Leaf	4.98	0.34	2.79	0.88	0.45	28	29	24	145	78
	Tuber Periderm	1.97	0.23	2.85	0.05	0.10	16	5.3	12	160	166
3. 1344 kg/ha Gypsum	Leaf	5.11	0.34	2.72	0.82	0.42	35	29	25	129	87
	Tuber Periderm	2.04	0.22	2.90	0.06	0.10	16	6	12	26	157
4. 2016 kg/ha Gypsum	Leaf	5.19	0.38	2.93	0.82	0.43	37	31	27	150	86
	Tuber Periderm	2.06	0.24	2.93	0.06	0.10	16	6	12	26	182

* Mid-season for leaf and petiole and tuber periderm of harvest.

TABLE 5: YIELD RESPONSE IN THE SIZE RANGE 30->60mm OF POTATO CULTIVAR SHEPODY WITH STEM-END BROWNING AND HOLLOW HEART AS AFFECTED BY FOUR LEVELS OF GYPSUM APPLICATION

TREATMENT	MEAN YIELD t/ha (30-> 60mm)	
	STEM END BROWNING	HOLLOW HEART
1. 0 kg/ha Gypsum	15.64[A]	Nil
2. 672 kg/ha Gypsum	16.00[A]	Nil
3. 1344 kg/ha Gypsum	14.18[A]	Nil
4. 2016 kg/ha Gypsum	15.29[A]	Nil

TABLE 6: TUBER SPECIFIC GRAVITY, FRENCH FRY COLOR AND SUCROSE CONTENT OF SHEPODY POTATO CULTIVAR AS AFFECTED BY FOUR LEVELS OF GYPSUM APPLICATION

TREATMENT	MEAN TUBER SPECIFIC GRAVITY	MEAN FRENCH FRY COLOR-MEAN USDA EQUIVALENT*	MEAN SUCROSE CONTENT-mg/g
1. 0 kg/ha Gypsum	1.064	1.18	1.98
2. 672 kg/ha Gypsum	1.064	1.13	1.90
3. 1344 kg/ha Gypsum	1.064	1.15	1.99
4. 2016 kg/ha Gypsum	1.064	1.10	2.08

672 kg/ha treatment was significantly better than the control. Tuber periderm Ca% was unaffected by the treatment, and this seems to be the case for soils which test high in Ca. Leaflet %Ca was also unaffected by the gypsum treatments.

These studies will continue for 2 more years.

ACKNOWLEDGEMENTS: The authors respectfully acknowledge the work of D. McIsaac for carrying out specific gravity and other tuber analyses needed.

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RESPONSE OF RUSSET BURBANK POTATO CULTIVAR TO DIFFERENT CALCIUM TREATMENTS

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ABSTRACT: Different calcium carriers were applied on the Holmesville soil series (pH 5.5-5.8) to a crop of Russet Burbank potato cultivar. The treatments were N-hib Ca in a single application (59 kg/ha N + 40 kg/ha Ca); N-hib Ca in a split application (59 kg/ha N + 40 kg/ha Ca); gypsum 672 kg/ha; Cal-U-Sol 168 kg/ha (34 kg/ha Ca + 17 kg/ha S + 8 kg/ha Mg) and a control where no calcium was applied. Total yield, and the undersized tubers were unaffected by the calcium treatments. Cal-U-Sol produced significantly less off-type tubers compared to gypsum or N-hib Ca, but was not better than the control. Cal-U-Sol and the control produced a significantly higher yield of marketable tubers than N-hib Ca applied once and gypsum.

None of the calcium treatments had any significant effect upon specific gravity, tuber periderm % Ca, french fry color or sucrose content. The method of periderm removal and the sample amount may have affected tuber periderm values observed. However, tuber periderm % Ca was increased in all treatments except the control. Claims that N-hib Ca would increase yield, P, K and Mg uptake in plant tissue were not in evidence. Cal-U-Sol treatments had a lower leaf % N at mid-season than other treatments and paled towards the end of the season. These studies will continue for two more years.

RÉACTION DE CULTIVARS DE POMMES DE TERRE RUSSET BURBANK À DIVERS TRAITEMENTS AU CALCIUM

Résumé: Divers produits comprenant du calcium ont été appliqués à des cultivars de pommes de terre Russet Burbank cultivés dans des sols de type Holmesville (pH de 5,5 à 5,8). Les traitements ont consisté en une application simple de N-hib-calcium (59 kg d'azote et 40 kg de calcium par hectare), une application combinée de N-hib-calcium (59 kg d'azote et 40 kg de calcium par hectare), une application de gypse (672 kg/ha), une application de 168 kg de Cal-U-sol par hectare (34 kg de Ca par hectare + 17 kg de S par hectare + 8 kg de Mg par hectare), et aucun traitement n'a été appliqué sur une parcelle témoin. Le rendement total et le nombre de tubercules trop petits n'ont pas été modifiés par les traitements au calcium. On comptait moins de tubercules hors type dans les parcelles traitées avec du Cal-U-Sol que dans celles traitées avec le gypse ou le N-hib-calcium, mais les résultats n'étaient pas meilleurs que celui obtenu dans la parcelle témoin. Les parcelles traitées avec du Cal-U-Sol et les parcelles témoins ont donné un rendement beaucoup plus élevé de tubercules commercialisables que celles ayant subi un traitement de N-hib-calcium en application simple et de gypse.

Aucun des traitements au calcium n'a eu d'effet notable sur la densité relative, la teneur en calcium de la pelure, la couleur des frites ou le taux de sucrose. La méthode utilisée pour peler les tubercules et la quantité de pelure analysée peuvent avoir une incidence sur les taux de calcium observés. Toutefois, la teneur en calcium de la pelure a augmenté dans toutes les parcelles traitées et non dans la parcelle témoin. On n'a pas pu démontrer que le N-hib-calcium pouvait augmenter le rendement et la capacité d'absorption de P, K et Mg dans les tissus des plantes. Les traitements au Cal-U-Sol ont diminué plus que les autres traitements la teneur en azote des feuilles à la mi-saison, et leur efficacité diminuait vers la fin de la saison. Ces études se poursuivront pendant deux autres années.

INTRODUCTION: The importance of calcium (Ca) in the production of peanuts has been well documented and it is only in recent years that attention has been focused on Ca nutrition in potato tuber health and development. Several researchers have shown the importance of high Ca concentration in the potato tuber to be necessary to reduce bacterial soft rots (Engelhard, 1989). Problems with Ca deficiency in potatoes are localized in the tuber and not the foliage. This is the result of several factors. Firstly, Ca is taken up by the roots and moves exclusively through the xylem to the leaves - the tubers are by-passed. Secondly, Ca in the leaves does not move

back down to the tubers as movement of Ca in phloem is minimal. Thirdly, tubers and stolons must take up needed Ca directly from the soil through their unsuberised tips. As a result, proper Ca nutrition of tubers requires stolons and tubers to be immediately surrounded by high levels of calcium.

Thorne (1989) reported that Internal Brown Spot (IBS), a disorder in tubers prevalent under conditions of intense summer temperature changes and rapid vine growth, is the result of inadequate Ca nutrition. It is postulated that since the foliage of potato plants compete for Ca with the tuber, under rapid vine growth and rapid moisture withdrawal, Ca may actually be pulled away from the tuber resulting in IBS. Liquid calcium ammonium nitrate 17 (CAN 17 - 8% Ca; 11.6% nitrate N), supplying 25 lbs/ac of Ca was found to be as effective for increasing Ca content of the potato tuber periderm as 225 lbs/ac of calcium supplied through 1125 lbs of gypsum; and thus reducing IBS. Indeed, Ca% in the tuber periderm has been shown to be a good indicator of Ca content of the tuber itself. Engelhard (1989) reported ranges of Ca in the tuber periderm to be 0.057-0.277%.

Simmons et al (1988) have shown that gypsum (pelleted, sieved or granulated) applied broadcast, sidedressed or in a preplant strip is an excellent source of Ca and effective in increasing tuber periderm Ca concentration. Stoller (1989) in setting up a model for Ca as the "second messenger", stated that Ca will move into the tuber, only if the tuber loses water, and further that when potatoes are heavily watered, tubers closer to the soil surface will often have fewer Ca related problems, because they lose more moisture.

Stoller (1989), in recognizing that Ca allows the crop to use more ammonium nitrogen, introduced a product called N-hib Calcium - a calcium/urea formulation (12% N; 8% Ca) for use in potatoes and other crops. Increased yields, increased tuber periderm % Ca, increased phosphate in petioles, increased K and Mg in tissues, better quality and higher specific gravity have all been associated with the use of the product, (Stoller, 1989). With all this increasing emphasis on Ca and potato yields it was decided to examine several calcium supplying products over the next 2 years to observe their effects on potato yield and quality and tuber periderm % Ca. It was decided to examine the following products:

- N-hib Calcium - 12% N; 8% Ca.
- Gypsum - 22% Ca; 16% S.
- Cal-U-Sol - 20% Ca; 10% S and 4.5% Mg.

METHODS: Cut seed (60g approximately) of Russet Burbank

was planted on the Holmesville clay loam soil series (pH 5.5) on May 26, 1989. Rotation in the field was potatoes, peas, winter rye, potatoes. A RCBD was employed and the following treatments were imposed:

Treatments

1. Basic fertilizer application - 1232 kg/ha 15-15-15 banded at planting with no calcium.

2. Basic fertilizer application - 1232 kg/ha 10-15-15 banded at planting plus 393 L/ha N-hib Ca (12% N, 8% Ca) in applications side-dressed on June 23 and July 12.

   - Density of N-hib Ca 5.76 kg/4.5 L.

3. Basic fertilizer application - 1232 kg/ha 10-15-15 banded at planting plus 393 L/ha N-hib Ca (12% N, 8% Ca) in a single application on June 23.

4. Basic fertilizer application - 1232 kg/ha 15-15-15 banded at planting plus 672 kg/ha of gypsum (22% Ca, 16% S) top-dressed post-planting on May 29.

5. Basic fertilizer application - 1232 kg/ha 15-15-15 banded at planting plus 168 kg/ha Cal-U-Sol (20% Ca, 10% S, 4.5% Mg) mixed in with the fertilizer.

The crop was harvested on October 9. Soil and leaf analyses were taken at mid-season. Tuber periderm %Ca was determined by peeling tubers with a carrot peeler. Rainfall in July, during tuber initiation and early tuber development was 50% of normal.

RESULTS AND DISCUSSION: Yields: Table 1 shows the yield of the Russet Burbank cultivar with different calcium treatments. All the treatments including the control gave an excellent yield. The treatments had no significant effect upon total yield, though the N-hib Ca applied in a split application gave the highest total yield. Cal-U-Sol produced significantly less off-type tubers than the N-hib Ca and gypsum treatments, but no different from the control. For marketable yield, Cal-U-Sol and the control produced significantly better yield than the N-hib Ca applied once and gypsum. This is interesting because Cal-U-Sol treatments became pale yellow and clearly were senescing earlier than the other treatments. It has been noted over the years that potato crops that run out of N and pale towards the end of the season raise only the concern of the viewer, but have been known to produce good marketable yields.

TABLE 1: EFFECT OF DIFFERENT CALCIUM TREATMENTS ON YIELD OF RUSSET BURBANK POTATO CULTIVAR

Treatment	Yield t/ha			
	Undersized (<84g)	Marketable yield 84 - >283g	Off Type	Total
1. No calcium	8.14	32.61^{ABC}	6.28^{AB}	47.04^{A}
2. N-hib Ca-split appl. 393 L/ha	7.30	33.78^{AB}	7.08^{A}	48.15^{A}
3. N-hib Ca-single appl. 393 L/ha	6.96	30.58^{C}	7.37^{A}	44.91^{A}
4. Gypsum - 672 kg/ha	7.56	31.40^{BC}	6.37^{A}	45.33^{A}
5. Cal-U-Sol-168 kg/ha	7.13	35.27^{A}	4.47^{B}	46.87^{A}

Duncan's Multiple Range Test - 0.05 level. Means with the same letter are not significantly different from each other in the same group.

Soil Analyses: Table 2 shows the mean soil analyses prior to planting (brackets) and 8 weeks post application. There was a noted decrease in pH in all the treatments including the control. The yields in all the treatments were so good that a pH decline, and a reduction in soil K is understandable.

TABLE 2: MEAN SOIL ANALYSIS OF DIFFERENT CALCIUM TREATMENTS PRIOR TO PLANTING (BRACKETS) AND 8 WEEKS POST APPLICATION

Treatment	Soil Analyses					
	pH	O.M. %	kg/ha P_2O_5	kg/ha K_2O	kg/ha Ca	kg/ha Mg
1. No calcium	5.1	2.7	513+	328	1317	182
	(5.7)	---	(513+)	(200)	(1100)	(110)
2. N-hib Ca-split application	5.5	2.4	513+	430	885	98
	(5.8)	---	(513+)	(186)	(1103)	(119)
3. N-hib Ca-single application	5.1	2.7	513+	323	1443	177
	(5.5)	---	(513+)	(276)	(1109)	(154)
4. Gypsum - 672 kg/ha	5.2	2.6	513+	407	1231	119
	(5.7)	---	(513+)	(200)	(1121)	(110)
5. Ca.-U-Sol - 168 kg/ha	4.7	2.5	513+	246	995	102
	(5.5)	---	(513+)	(166)	(1103)	(154)

Specific Gravity, Sucrose Content, French Fry Color and Tuber Periderm % Ca: Table 3 shows the data for the effect of the various calcium treatments on specific gravity, sucrose content, french fry color and tuber periderm % Ca. None of the treatments had any significant effect upon specific gravity, sucrose content, french fry color or tuber periderm % Ca. However, all the calcium treatments increased tuber periderm % Ca over the control.

TABLE 3: EFFECT OF DIFFERENT CA TREATMENTS ON SPECIFIC GRAVITY, SUCROSE CONTENT, FRENCH FRY COLOR AND TUBER PERIDERM %CA OF RUSSET BURBANK

Treatment	Specific Gravity	Sucrose Content mg/g	French Fry Color	Tuber Periderm % Ca
1. No calcium	1.077	1.28	4.5	0.03[A]
2. N-hib Ca-split application	1.073	1.52	4.4	0.05[A]
3. N-hib Ca - single application	1.075	1.44	4.0	0.05[A]
4. Gypsum-672 kg/ha	1.078	1.54	4.0	0.05[A]
5. Cal-U-Sol 168 kg/ha	1.074	1.49	4.5	0.05[A]

Duncan's Multiple Range Test - 0.05 level. Means with the same letter are not significantly different from each other.

Leaf and Tuber Periderm Analyses: Table 4 shows data in relation to leaf and petiole and tuber periderm % Ca for all the treatments. As noted before all the calcium treatments increased tuber periderm % Ca though not significantly over the control. Cal-U-Sol had some effect upon N content of the leaf as this was 5.50% compared to over 6.0% for the control and the other treatments. Towards the end of the season Cal-U-Sol treatments were paler than the others, but this is not necessarily a bad feature prior to harvest. Other than tuber periderm % Ca, claims that phosphate levels, K levels, Mg levels and yields will be increased by some of these products were not apparent. Over the next two years further observations on these parameters will be carried out.

TABLE 4: MEAN LEAF AND PETIOLE AND TUBER PERIDERM ANALYSES ON RUSSET BURBANK POTATO CULTIVAR AS AFFECTED BY DIFFERENT CALCIUM TREATMENTS

TREATMENT	PLANT PART	% N	% P	% K	ppm Ca	ppm Mg	ppm Zn	ppm B	ppm Cu	ppm Mn	ppm Fe
					TESTED						
1. No calcium	Leaf*	6.20	0.60	3.47	0.51	0.37	39	10	18	174	106
	Tuber Periderm	2.12	0.25	2.90	0.03	0.10	24	5	11	22	203
2. N-Hib Ca-split applic.	Leaf	6.00	0.45	3.59	0.69	0.40	36	12	17	219	102
	Tuber Periderm	2.26	0.23	2.95	0.05	0.09	25	6	12	30	198
3. N-Hib Ca-single applic.	Leaf	6.00	0.50	3.80	0.56	0.33	37	12	18	190	104
	Tuber Periderm	2.24	0.24	2.92	0.05	0.10	26	5	12	30	233
4. Gypsum 672 kg/ha	Leaf	6.20	0.59	3.37	0.53	0.40	39	12	19	151	101
	Tuber Periderm	2.16	0.24	2.74	0.05	0.10	24	5	11	18	172
5. Cal-U-Sol 168 kg/ha	Leaf	5.50	0.47	3.76	0.59	0.34	50	15	18	234	113
	Tuber Periderm	2.00	0.22	2.99	0.05	0.10	22	5	10	30	217

* Leaf and Petiole at mid-season.
Tuber periderm after harvest.

Costs of Application: The approximate cost of application of N-hib Ca twice was $202/ha; for N-hib Ca once was $101/ha; for gypsum it was $44/ha and for Cal-U-Sol it was $86/ha and for the control $0/ha.

CONCLUSION: None of the calcium treatments had any significant effect upon total yield, or undersized (smalls) tubers. Cal-U-Sol produced significantly less off-type tubers compared to N-hib Ca or gypsum but was not better than the control. Cal-U-Sol and the control plots produced a significantly higher yield of marketable

tubers than the N-hib Ca applied once and gypsum. None of the treatments had any significant effect upon specific gravity, tuber periderm % Ca, french fry color or sucrose content. All the calcium treatments increased tuber periderm Ca% equally as compared to the control. Cal-U-Sol treatments all paled towards the end of the growing season and leaf N% was lower at mid-season compared to other treatments including the control.

Costs of the N-hib Ca and Cal-U-Sol treatments exceed $86/ha and no significant increase in total yield was observed over the control or gypsum treatment which cost $44/ha. Based on 1989 date, there can hardly be any justification for applying these expensive products, but firm conclusions will be drawn over the next two years.

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PRELIMINARY OBSERVATIONS ON YIELD AND SCAB INCIDENCE OF YUKON GOLD POTATO CULTIVAR AS AFFECTED BY GYPSUM/GREEN MANURE TREATMENTS

R.P. Hinds and A.F. Perley

ABSTRACT: Yukon Gold potatoes (scab-susceptible) were planted on the Holmesville clay loam soil series (pH 5.0-5.6) naturally infested with common scab Streptomyces scabies. Two gypsum applications (672 and 0 kg/ha) were made to a previous green manure of timothy and red clover. Observations indicate that total and marketable yield were not affected by gypsum. The high level of weed infestation was responsible for about 30% decrease in yields. The incidence of scab was higher on the red clover treatments than on the timothy and was higher where weed infestation was greatest. Total and marketable yield was also higher on the clover side than on the timothy side. Leaf plus petiole Ca% was higher under the gypsum treatments but tuber periderm % Ca indicated no consistent pattern. The method of periderm removal and sample amount for analysis may have influenced readings observed. Specific gravity was better and sucrose content was lower under gypsum applications. These preliminary observations will form the basis for a three year study of cultural practices and gypsum on yield and incidence of scab in Shepody.

OBSERVATIONS PRÉLIMINAIRES SUR LE RENDEMENT DE CULTIVARS DE POMMES DE TERRE YUKON ET SUR LA FRÉQUENCE DES CAS DE GALE À LA SUITE DE TRAITEMENTS AU GYPSE ET À L'ENGRAIS VERT

Résumé: Des pommes de terre Yukon Gold (sensibles à la gale) ont été plantées dans des sols de type Holmesville formés de loam argileux (pH variant de 5 à 5,6) naturellement infestés par la gale commune Streptomyces scabies. Des applications de gypse ont été faites à raison de 0 et 672 kg/ha dans une parcelle traitée avec un engrais vert composé de fléole et dans une parcelle traitée avec un engrais vert composé de trèfle violet. Les observations indiquent que le rendement total et le rendement de tubercules commercialisables n'ont pas varié par suite de l'application de gypse. Cependant, les mauvaises herbes étaient responsables d'environ 30 % de la baisse de rendement. La fréquence des cas de gale était plus grande sur la parcelle traitée avec le trèfle violet que sur celle traitée avec la fléole, ainsi qu'aux endroits où l'infestation par les mauvaises herbes était plus grande. Le rendement total et le rendement de tubercules commercialisables étaient également plus élevés sur la parcelle où avait poussé le trèfle que sur celle où avait poussé la fléole. La teneur en calcium des feuilles et des pétioles était plus élevée dans les parcelles traitées avec du gypse, mais on n'a pu discerner de modification constante de la teneur en calcium de la pelure. La méthode utilisée pour peler les tubercules et la quantité de pelure analysée ont pu avoir une incidence sur les résultats obtenus. La densité relative était plus grande et le taux de sucrose plus faible dans les pommes de terre traitées avec du gypse. Ces observations préliminaires serviront de base à une étude de trois ans concernant les effets des pratiques culturales et du gypse sur le rendement et la présence de la gale dans la pomme de terre Shepody.

INTRODUCTION: Common scab of potato, when severe, can severely reduce the quality of an otherwise good marketable crop. According to Bergey's Manual of Determinative Bacteriology, the taxonomic position of the causal agent Streptomyces scabies is still uncertain, but for purposes of this discussion, the pathogen is being referred to as a gram positive filamentous bacterium (Anderson and Lorang, 1988).

Information about plant nutrients in relation to potato scab has been limited in general, to macro and micronutrients, nutrient concentration in soil and infrequently nutrient concentration in potato tubers. Much of the literature on potato scab control deals with the application of nutrients to the soil which also

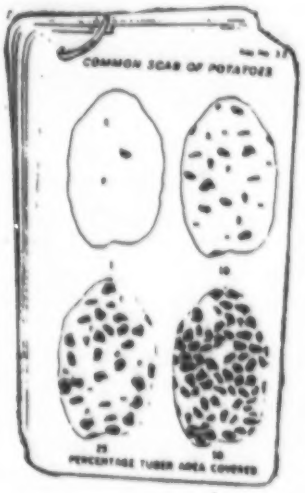
affect soil pH. Under field conditions, disease incidence occurs over a range of pH, from very low 4.5 to over 8.0. But while disease incidence and severity may be pH related, high soil moisture has been shown, regardless of pH, to reduce scab (Hammerschmidt et al, 1989). Gypsum and elemental sulphur have been shown to reduce scab incidence. In addition to plant nutrients to manage scab, other control methods include seed treatments (pentachloronitrobenzine PCNB), crop rotations, green manures, irrigation timing and varietal resistance (Engelhard ed: 1989, Anderson and Lorang, 1988).

Since S. scabies is ubiquitous and so well adapted, many workers feel no single control strategy will provide total disease control. Indeed elimination of scab may be both unfeasible and unnecessary, since growers, processors and consumers are willing to tolerate some blemishes on tubers. As a result, a three year effort is being designed to examine the combined effects of a green manure with gypsum, under rain-fed production in NB, in an effort to determine the degree of scab control in scab-susceptible commercial varieties on soils with long histories of the disease. This study represents only a preliminary look at the possible outcomes and will serve as a basis for work to be enjoined and continued.
MATERIALS AND METHODS: One section of a field on the Holmesville clay loam soil series was planted in 1988 to red clover and the other section to timothy. Both crops were moldbord plowed (i.e. plowed down green) in the spring of 1989 and planted to a scab-susceptible potato cultivar, Yukon Gold. Each of the previously planted green manures, after planting with Yukon Gold, was divided into two, and one portion was treated with 672 kg/ha gypsum and the other portion received no gyspum in the manner shown below.

(previously) Timothy		(previously) Red Clover	
no gypsum	672 kg/ha gypsum	672 kg/ha gypsum	no gypsum
Yukon Gold		Yukon Gold	

These observation plots were monitored for pH, O.M.% and other soil nutrients before and 8 weeks post-planting. Leaf analyses were carried out at mid-season. Tuber periderm was removed by a carrot peeler for analysis. Yield, U.S.D.A. color, specific gravity, rainfall and dry

matter additions from the green manure crops were noted. Scab incidence and severity were determiined on the basis of the percentage of tuber area covered with scab lesions and indicated in the key below (Can. Plant Dis. Surv: 51, 1971).



The potato crop was planted on June 3, and harvested September 19, 1989. Fertilization was at the rate of 135 kg/ha each of N, P and K. Source of N was ammonium nitrate. Rainfall recorded was 50% of normal for the month of July.

RESULTS AND DISCUSSION: Growth and Yield: Observations on yield response of Yukon Gold potato cultivar at two levels of gypsum feritlization to prior green manure treatments are given in Table 1 and Table 2.

TABLE 1: YIELD RESPONSE OF YUKON GOLD CULTIVAR AT TWO LEVELS OF GYPSUM FERTILIZATION TO PRIOR GREEN MANURE TREATMENTS

Treatment		Mean Yield - t/ha			
Prior Green Manure Treatment-Dry Matter Added t/ha	Gypsum* Applied	Sizes <30 mm	30-60 mm	>60mm	Total
1. Timothy-9.75 t/ha D.M.	672 kg/ha	0.82	6.91	14.63	22.36
2. Timothy-9.75 t/ha D.M.	0 kg/ha	1.62	11.38	9.76	22.76
3. Red Clover-5.05 t/ha D.M.	672 kg/ha	1.22	10.57	14.22	26.01
4. Red Clover-5.05 t/ha D.M.	0 kg/ha	1.52	9.76	17.48	28.87

* Gypsum - 22% Ca; 16% S.

TABLE 2: MARKETABLE YIELD IN RELATION TO SOIL pH, CALCIUM CONTENT OF SOIL, LEAF & PETIOLE AND TUBER PERIDERM OF YUKON GOLD POTATO CULTIVAR AT TWO LEVELS OF GYPSUM FERTILIZATION TO PRIOR GREEN MANURE TREATMENTS

Treatment	Mkt Yld t/ha	pH 8 wks post planting	Calcium* content of soil kg/ha	Calcium content of leaf &petiole %	Calcium content of tuber periderm %
1. Timothy/672 kg/ha Gypsum	21.54	5.4	1173	0.87	0.05
2. Timothy/0 kg/ha Gypsum	21.14	5.6	1782	0.78	0.06
3. Red Clover/672 kg/ha Gypsum	24.79	5.2	1520	0.93	0.04
4. Red Clover/0 kg/ha Gypsum	27.24	5.0	1256	0.87	0.03

* Values are medium for NB Soils

Overall growth and yield of Yukon Gold was poor as a result of weed infestation. The predominant weed was lamb's quarters (Chenopodium album L.) and there was slightly more weeds on the timothy side of the plots than on the red clover side. Observations of yields in areas where there were little or no weeds, showed that yields were 30% greater than the weedy sections of the treatments.

Gypsum had no great effect upon total or marketable yield but the degree of weed infestation may have conpounded this as previous work (Hinds, 1982) has shown gypsum to have positive effects upon both total and marketable yield in NB. Simmons and Kelling (1987) also reported that on low-Ca soils, gypsum (1680 kg/ha) while it did affect total yield, improved tuber grade and/or marketable yield.

The red clover side of the field produced a higher total and marketable yield than the timothy side. It is uncertain what role, if any, the amount of dry matter addition played in this issue since leaf and petiole N in all treatments were similar (Table 6). Simmons and Kelling (1987), on low-Ca soils where gypsum improved tuber grade and marketable yield, showed these improvements were accompanied by increased periderm Ca concentrations but leaflet Ca concentrations were unaffected. It was also reported that on higher test Ca-soils, responses were inconsistent and tuber periderm Ca was generally not increased. On these observation plots, the soil was medium-Ca tested and yield was slightly higher with lower tuber periderm Ca% and higher leaf & petiole Ca%. These observations will be followed up further in future trials.

Yield and Scab Incidence: The literature is replete with work indicating that the incidence of scab is reduced through the addition of gypsum and sulfur (David et al, 1974), green manures, crop rotations (Anderson and Lorang, 1988) and green manures and irrigation (Hammerschmidt et al, 1989). Observations to indicate the incidence of scab in Yukon Gold potato cultivar at two levels of gypsum to prior green manure treatments are given in Table 3.

TABLE 3: SCAB INCIDENCE OF YUKON GOLD POTATO CULTIVAR AT TWO LEVELS OF GYPSUM FERTILIZATION TO PRIOR GREEN MANURE TREATMENTS

Treatment		Yield t/ha	
Prior Green Manure Treatment-Dry Matter Applied t/ha	Gypsum Applied	Tuber Area% Covered With Scab Lesions	
		0-10 %	>10%
1. Timothy - 9.75 t/ha D.M.	672 kg/ha	20.5 (92%)*	1.86 (8%)
2. Timothy - 9.75 t/ha D.M.	0 kg/ha	22.76 (100%)	0.00 (0%)
3. Red Clover-5.05 t/ha D.M.	672 kg/ha	20.80 (80%)	5.21 (20%)
4. Red Clover-5.05 t/ha D.M.	0 kg/ha	23.67 (82%)	5.20 (18%)

* Brackets - % of total yield.

Table 3 shows the yield (t/ha) of tubers whose tuber surface area was covered from 0-10% with scab lesions and also greater than 10%. Gypsum together with the green manure did not affect scab incidence and this may be attributed to the high intensity of weeds. It was observed that the greater the weed coverage, the greater the scab incidence, regardless of treatment. Even though there was less weeds on the red clover side, the yield of tubers with a high incidence of scab was greater on the red clover side than the timothy side. Hammerschmidt et al (1989) reported red clover significantly increased scab in their work and also high soil moisture (through irrigation and rainfall) decreased scab incidence. During the period of tuber initiation and growth, rainfall was 50% of normal and together with the weed infestation, moisture was limiting and may have worsened the scab situation. Tubers removed from among the densest weeds were 100% covered with scab lesions.

Specific Gravity, French Fry Color and Sucrose Content: Table 4 shows the specific gravity, french fry color and sucrose content as affected by the gypsum/green manure treatments. Gypsum produced a slightly better specific gravity and lower sucrose content than where no gypsum was applied. The red clover side produced better specific gravity and lower sucrose content than the timothy side.

TABLE 4: SPECIFIC GRAVITY, FRENCH FRY COLOR AND SUCROSE CONTENT OF YUKON GOLD AS AFFECTED BY TWO LEVELS OF GYPSUM TO PRIOR GREEN MANURE TREATMENTS

TREATMENT	SPECIFIC GRAVITY	FRENCH FRY COLOR MEAN U.S.D.A. EQUIVALENT*	MEAN SUCROSE CONTENT - mg/g
1. Timothy/672 kg/ha Gypsum	1.079	1.0	1.88
2. Timothy/0 kg/ha Gypsum	1.066	1.0	2.37
3. Red Clover/672 kg/ha Gypsum	1.077	1.0	0.82
4. Red Clover/0 kg/ha Gypsum	1.076	1.0	1.14

* U.S.D.A. color of 1-4 is acceptable. Higher numbers correspond to a worsening of color.

Soil, Leaf & Petiole and Tuber Periderm Analyses: Table 5 and 6 show mean soil, leaf plus petiole and tuber periderm analyses for the gypsum/green manure treatments. The red clover side of the field had a lower pH but higher organic matter at 8 weeks post-planting, and produced higher scab incidence but higher yield that the timothy side. Leaf and petiole Ca% was higher on the gypsum treated plots than where no gypsum was applied and was higher on the clover side than on the timothy side. Tuber periderm Ca% was generally not increased by the gypsum and this may be due to the medium test Ca-level of the soil under treatment and also the method of removal of the periderm and the sample amount used in the analysis. The range of tuber periderm Ca% is generally from 0.057 to 0.277% on a dry weight basis. Tuber periderm %Ca was lower on the red clover side where there was more scab than on the timothy side. Davis et al (1974) has associated reduced scab with lower Ca% in the tuber periderm and also low soil moisture, which increases scab, results in higher Ca concentrations in tuber periderm. Tuber periderm Ca% was lower than normal in the tuber periderm even though there was a drought during tuber initiation and development in this preliminary work.

TABLE 5: MEAN SOIL ANALYSIS RESULTS OF GREEN MANURE/ GYSPUM TREATED PLOTS OF YUKON GOLD POTATO CULTIVAR - 8 WEEKS POST GYPSUM TREATMENT

TREATMENT PRIOR GREEN MANURE TREATMENT-DRY MATTER APPL.t/ha	GYPSUM APPLIED	pH	O.M. %	P_2O_5 kg/ha	K_2O kg/ha	Ca kg/ha	Mg kg/ha
1. Timothy-9.75 t/ha D.M.	672 kg/ha	5.4	2.8	513+	430+	1173	122
2. Timothy-9.75 t/ha D.M.	0 kg/ha	5.6	3.0	513+	430+	1782	142
3. Red Clover-5.05 t/ha D.M.	672 kg/ha	5.2	3.1	513+	430+	1520	120
4. Red Clover-5.05 t/ha D.M.	0 kg/ha	5.0	3.1	513+	430+	1256	111

TABLE 6: MEAN LEAF AND TUBER PERIDERM ANALYSES OF SHEPODY POTATO CULTIVAR AS AFFECTED BY FOUR LEVELS OF GYPSUM

TREATMENT	PLANT PART TESTED	%					ppm				
		N	P	K	Ca	Mg	Zn	B	Cu	Mn	Fe
1. Timothy 672 kg/ha Gypsum	Leaf*	5.26	0.38	3.10	0.87	0.32	24	29	16	91	100
	Tuber Periderm	1.85	0.21	2.78	0.05	0.10	14	8	5	30	256
2. Timothy 0 kg/ha Gypsum	Leaf	5.29	0.40	3.14	0.78	0.31	27	25	16	105	89
	Tuber Periderm	1.78	0.22	3.33	0.06	0.12	14	9	6	13	187
3. Red Clover 672 kg/ha Gypsum	Leaf	5.25	0.40	3.26	0.93	0.35	42	26	16	101	78
	Tuber Periderm	1.72	0.18	2.66	0.04	0.10	14	8	5	19	226
4. Red Clover 0 kg/ha Gypsum	Leaf	5.17	0.38	3.24	0.87	0.36	30	26	16	82	73
	Tuber Periderm	1.65	0.18	2.68	0.03	0.09	12	8	4	18	212

* Mid-season for leaf and petiole tuber periderm at harvest.

CONCLUSIONS: Preliminary observations of gypsum applications to prior green manure treatments on the medium Ca-test Holmesville clay loam soil series (naturally infested with Streptomyces scabies) indicate that total and marketable yield was unaffected by the gypsum applications. A high level of weed infestation may have been responsible for this and the low yields in general, by creating a more droughty effect than would otherwise have been the case. The red clover side produced higher yields than the timothy side but also produced higher incidence of scab than the timothy side. Weed infestation reduced yields by 30% and scab incidence in Yukon Gold was greatest in the more weedy sections of the treatments regardless of gypsum.

Gypsum produced slightly better specific gravity and lower sucrose than the untreated gypsum plots. Tuber periderm %Ca was not increased with applied gypsum probably because of the medium Ca-test level of the soil, the periderm removal method and the sample amount used for analysis. This work was the basis of future work on several green manure/gypsum trials to be looked at over the next three years.

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EFFECT OF DEEP RIPPING FOLLOWING TILE DRAINAGE AND CROP ROTATION ON YIELD AND QUALITY OF POTATOES

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ABSTRACT: Deep ripping was applied following the systematic tile installation in the fall of 1985. The increase of yield and quality of tubers harvested from the majority of ripped plots in 1986, 1987, 1988 and 1989 were marginal. Yield of barley and clover harvested from ripped plots in 1987 and 1988 were increased substantially in comparison to the control.

The rips persisted under the sweet clover crop for at least three years following the subsoil improvements. The roots penetrated through the subsoil and their proliferation was substantially increased in comparison to unripped subsoil.

1989 tuber yield and quality was increased by deep ripping perpendicular to the tiles; the closer spacing was more effective in comparison to wide spacing. Canada #1 yield was increased by up to 15.1% in comparison to the unripped control. The rips applied parallel to tiles did not positively affect tuber yield or quality.

Tuber yield was increased by the rotational crop that preceded the potato crop. The most beneficial effect was measured in tuber harvest following red clover. Canada #1 yield was increased up to 8.4% in comparison to potatoes in monoculture. The beneficial effects of other rotational crops, barley and sweet clover, were less pronounced.

LE SOUS-SOLAGE PROFOND UTILISÉ APRÈS LE DRAINAGE PAR TUYAUX ET LA ROTATION DES CULTURES ET SES EFFETS SUR LE RENDEMENT ET LA QUALITÉ DES POMMES DE TERRE

K.T.V. Michalica et J.L. Daigle

RÉSUMÉ: Le sous-solage profond a été effectué après l'installation de tuyaux de drainage à l'automne de 1985. L'amélioration du rendement et de la qualité des tubercules cultivés en 1986, 1988 et 1989 dans la plupart des parcelles travaillées a été marginale. Le rendement de l'orge et du trèfle cultivés en 1987 et 1988 dans les parcelles travaillées a augmenté considérablement par rapport à la parcelle témoin.

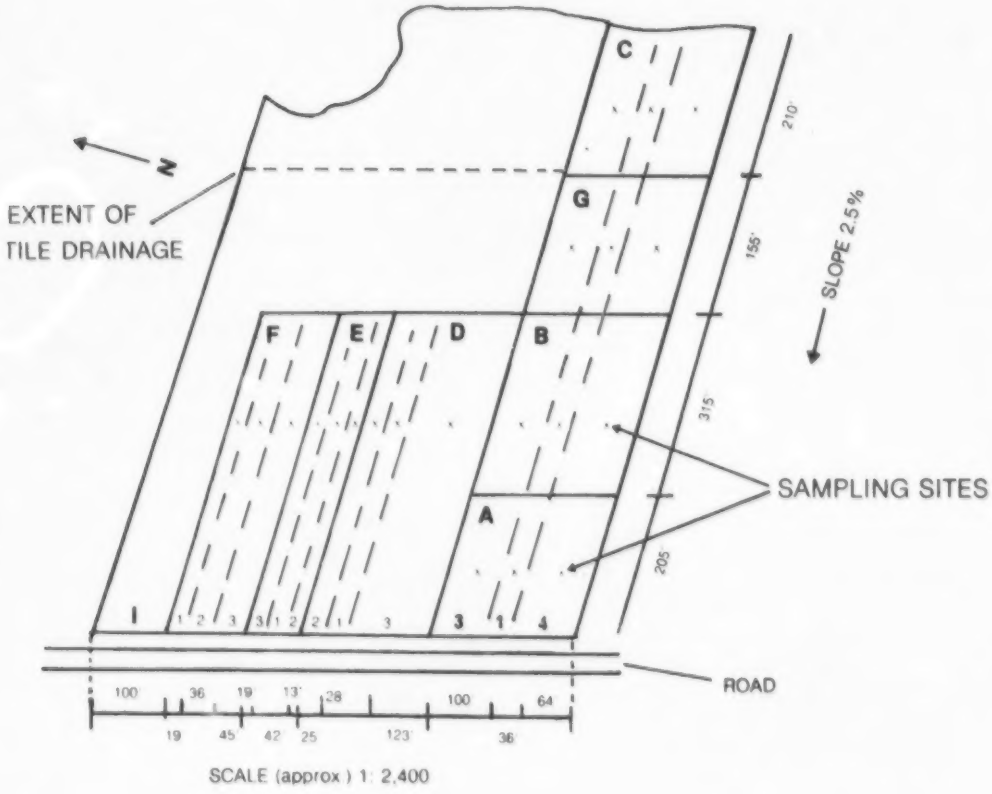
Les effets du sous-solage profond ont persisté pendant au moins trois ans dans un champ de mélilot. Les racines ont pénétré dans le sous-sol et se sont mieux développées que celles d'un sous-sol non travaillé.

Le sous-solage profond perpendiculaire aux tuyaux a permis d'améliorer le rendement et la qualité des tubercules en 1989, l'espacement plus étroit étant plus efficace que l'espacement plus grand. Cela a permis au rendement de la Canada n^{0} 1 d'augmenter de 15,1 % par rapport aux tubercules des parcelles-témoins non travaillées. Le sous-solage parallèle aux tuyaux n'a pas amélioré le rendement ni la qualité des tubercules.

Le rendement des tubercules a augmenté grâce aux cultures en rotation qui ont précédé la culture des pommes de terre. Le trèfle rouge a eu le meilleur effet sur le rendement des tubercules. Le rendement de la Canada n^{0} 1 a augmenté de 8,4 % par rapport aux pommes de terre en monoculture. Les effets positifs d'autres cultures en rotation, de l'orge et du mélilot ont été moins prononcés.

INTRODUCTION: Deep ripping was applied in order to loosen up the compacted subsoil. It was conducted by a tiling plow after systematic drain tiles were installed in the fall of 1985. The main goal of the project was to evaluate the effects of subsoil improvement in combination with rotational crops, on yield and quality of potatoes.

FIGURE 1.– Plot Layout 1989



A - tiled, subsoiled along tile; 7 ft. spacing, 36 in. depth
B - tiled, subsoiled along tile; 4-5 ft. spacing, 36 in. depth
C - non-tiled, non-subsoiled
D - tiled only
E - tiled, subsoiled across tile; 4-5 ft. spacing, 22 in. depth
F - tiled, subsoiled across tile; 6-7 ft. spacing, 22 in. depth
G - tiled only

1989 crops were potatoes that followed 1988 crops:

1 - sweet clover
2 - potatoes
3 - red clover
4 - barley

MATERIALS AND METHODS: A 7 hectare field in Comeau Ridge was improved by systematic tile installation (Gridiron design, 15m apart and 80-90 cm in depth) across the slope.

The soil series of the field is Holmesville sandy loam ranging to Siegas loam with very compacted silt loam to clay loam subsoil. The subsoil exhibits cementation (fragipan) at the depth of 40 to 50 cm. The slope of the field ranges from 2 to 5%, the drainage class ranges from well drained (the crest of the slope) to moderately well drained and imperfectly drained (the bottom of the slope).

Five ripping treatments were established within the field as follows (Figure 1):

A - ripped parallel to tiles, spacing 210 cm, 90 cm deep.
B - ripped parallel to tiles, spacing 140 cm, 90 cm deep.
E - ripped perpendicular to tiles, spacing 140 cm, 55 cm deep.
F - ripped perpendicular to tiles, spacing 200 cm, 55 cm deep.
D - unripped control.

Data was also collected from two additional plots within the same field but outside of the experimental area as follows (Figure 1):

C - well drained portion of the field, not tiled, unripped.
G - imperfectly drained, tiled, unripped area located at the upper part of the slope.

The ripping was conducted using a drainage plow. The original chisel was modified by installation of steel wings on the chisel sides so that the effective width of the chisel tooth was approximately 30 cm.

Yield of tubers was evaluated by manual harvest and weighing three randomly selected replicates of 10m linear single rows of potatoes. The quality of the tubers was evaluated by weighing proportions of tubers classified as Canada #1, Canada #2, culls and by evaluation of specific gravity by wet and dry weighing. Visual signs of disease, deviations from a regular shape, skin appearance and uniformity of tubers were also noted.

RESULTS AND DISCUSSION: The total 1989 tuber yield as affected by various ripping treatments ranged from 21.83 to 25.29t per hectare. Canada #1 yields ranged from 17.02 to 22.58t per hectare. Plots ripped perpendicular to tiles outyield the unripped control. The closer spaced ripped plots outyield the wider spaced ones. The Canada #1 tubers harvested from plots ripped

perpendicular to tiles and spaced 140 cm apart outyield the unripped control by 15.1%.

Ripping along the tiles did not improve tuber yield or quality. In fact, the yield and quality were lower in comparison to the control in 1989 (Table 1).

The specific gravity of tubers harvested from all ripped plots (with the exception of plot B, Figure 1) surpassed the specific gravity of tubers harvested from control (Table 2).

The effect of preceding crops on yield of tubers was also measurable. The largest yield increase was measured when potatoes followed red clover. Increases of total and Canada #1 tuber yield, in comparison with control were 8.1% and 8.4% respectively. The increases of the total tuber yield were 3.6 and 1.9% when potatoes followed barley and sweet clover respectively (Table 3).

CONCLUSIONS AND RECOMMENDATIONS: Deep ripping substantially increased yields of sweet clover, red clover and barley. Tuber yield and quality were improved to a lesser degree. Ripping applied perpendicularly to the tiles with close spacing effected the yield and quality of tubers to the largest degree in 1989, when ripping parallel to the tiles was found ineffective.

The positive results of the project measured by crop yield and quality, soil improvements and improved root penetration and proliferation warrant further investigations. The evaluation of the effectiveness of ripping on soil density, moisture, crop yield and quality, root penetration as well as its economy should continue.

TABLE 1: EFFECT OF RIPPING ON YIELD AND QUALITY OF TUBERS (1989)

Treatment	Tuber quality	Yield t/ha	% of total	Comments
A	Canada #1	17.02	77.93	two replicates
ripped along	Canada #2	1.88	8.63	scabby and
with the	culls	2.93	13.44	excessive
wide spacing	total	21.83	100.00	culls.
B	Canada #1	19.10	84.74	three repli-
ripped along	Canada #2	1.62	7.19	cates,scabby,
with the	culls	1.82	8.07	one replicate
tiles,close	total	22.54	100.00	excessive
spacing				culls
D	Canada #1	19.62	80.22	one replicate
(control)	Canada #2	2.61	10.65	scabby, one
	culls	2.23	9.13	replicate
	total	24.46	100.00	excessive culls.
E	Canada #1	22.58	89.26	three repli-
ripped across	Canada #2	1.66	6.58	cates smooth,
the tiles,	culls	1.05	4.16	uniform tubers
close spacing	total	25.29	100.00	
F	Canada #1	21.22	87.85	three repli-
ripped across	Canada #2	2.30	9.52	cates smooth,
the tiles,	culls	0.64	2.63	uniform tubers
wide spacing	total	24.16	100.00	
G	Canada #1	19.93	78.86	four repli-
upper slope	Canada #2	2.03	8.06	cates scabby,
tiled	culls	3.31	13.08	one replicate
unripped	total	25.27	100.00	excessive culls
C	Canada #1	21.62	85.45	one replicate
upper slope,	Canada #2	2.14	8.49	scabby
well drained	culls	1.53	6.06	unripped
total	25.29	100.00		

TABLE 2: EFFECT OF RIPPING ON SPECIFIC GRAVITY OF TUBERS (1989)

Treatment	Specific gravity g/cm^3
A (ripped along the tiles)	1.0714
B (ripped along the tiles)	1.0696
D (control)	1.0705
E (ripped across the tiles, close spacing)	1.0750
F (ripped across the tiles, wide spacing	1.0725
G (upper slope, tiled, unripped)	1.0727
C (upper slope, well drained, unripped	1.0690

TABLE 3: EFFECT OF PRECEDING CROP ON YIELD AND QUALITY OF TUBERS (1989)

Crop	Tuber Quality	Yield t/ha	% of Total
	Canada #1	21.16	84.39
Red	Canada #2	2.04	8.11
Clover	Culls	1.88	7.50
	Total	25.08	100.00
	Canada #1	19.73	82.06
	Canada #2	1.90	7.97
Barley	Culls	2.39	9.97
	Total	24.02	100.00
	Canada #1	19.66	83.19
Sweet	Canada #2	1.93	8.16
Clover	Culls	2.04	8.65
	Total	23.63	100.00
	Canada #1	19.51	84.07
	Canada #2	2.50	10.75
Potatoes	Culls	1.18	5.18
	Total	23.19	100.00

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